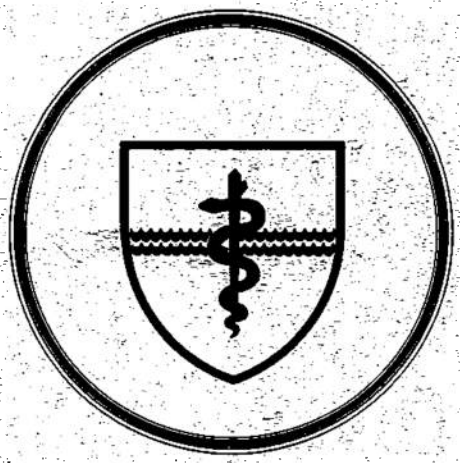
NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY

SUBMARINE BASE, GROTON, CONN.



REPORT NUMBER 1019

COMPUTER ASSISTED DIAGNOSIS

OF

CHEST PAIN

PRELIMINARY MANUAL

by

HMC Mark DECORA and Karen D. FISHERKELLER, M.A.

Naval Medical Research and Development Command
Work Unit #MF-585.27.1C1-0001

Released by:

William C. Milroy, CAPT, MC, USN
Commanding Officer
Naval Submarine Medical Research Laboratory
27 April 1984

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SUMMARY PAGE

THE PROBLEM:

To provide a status report on the Computer-Assisted Program for Diagnosis of Chest Pain. This document will serve as the basis for a reference manual and guide to the Chest Pain Patient Management System as it develops.

THE FINDINGS:

Presentation is made of the general aspects of chest pain diagnosis, program capabilities, computer operation, descriptions of program elements, programming flowcharts, programming statements, and general information necessary for system utilization.

APPLICATION:

The information presented will be of value as a reference guide to the present system as it evolves through addition of ECG components, an updated database, and treatment and training modules.

ADMINISTRATIVE INFORMATION

This report was submitted for review in April 1984 and approved for publication on 27 April 1984. It is designated as NAVSUBMEDRSCHLAB Report #1019.

ABSTRACT

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs, in the style of the computer-assisted diagnosis program for acute abdominal pain, to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. The purpose of the present report is to summarize and document the progress to date on the computer-based diagnostic program for chest pain. The disorders considered are: myocardial infarction, angina, pneumonia, pneumothorax, and non-specific (non-life-threatening) chest pain. A very preliminary version of a program to predict outcome of M.I. (myocardial infarction) is also presented.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

Medical evacuation from a patrolling nuclear submarine is costly in terms of risk to the patient, the expense of evacuation, and the compromise to the mission of the submarine. The medical responsibilities are borne by the Independent Duty (8402) Corpsman who must independently diagnose and manage any illness which presents during patrol. This includes making recommendations regarding evacuation to a shore-based facility. His diagnostic task is complicated by mission constraints which often prevent communication with shore-based medical facilities and by the limited medical diagnostic equipment aboard nuclear submarines; lacking, for example, X-ray facilities as well as many laboratory tests normally relied upon in the hospital or dispensary setting.

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. A program, in the style of the computer-assisted diagnosis program for acute abdominal pain (Arthur, NSMRL Report #974), is under development. The purpose of the present report is to summarize and document the progress to date on the computer-based diagnostic program for chest pain.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.

SECTION 2 - THE DIAGNOSTIC PROGRAM

2.1 INTRODUCTION

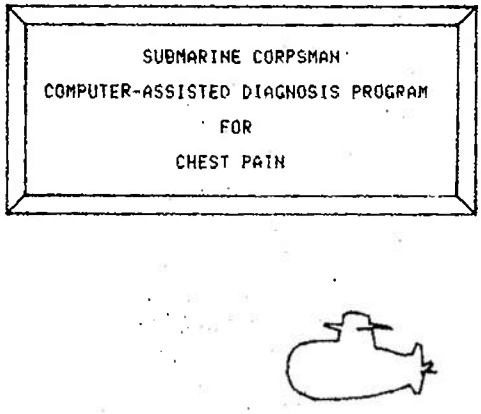
To date, there is one component of the computer-assisted diagnosis/ management program for chest pain, the diagnostic/prognostic program. This section will detail the function and use of this program.

To avoid redundancies, the reader is directed to NSMRL report #974: Computer-assisted Diagnosis Program for Acute Abdominal Pain by LCDR Donald C. Arthur, MC, USN, which contains an excellent guide to basic computer interaction in section 3.5.

Since the chest pain program is patterned after the abdominal pain program, all of the cautions regarding the importance of accurate data collection and precedence of corpsman judgment apply to this program as well.

Inserting the tape and pressing 'AUTOLOAD' will load the introductory page (FIGURE 2-1). This page will remain on the CRT screen while the diagnostic program is loaded into the computer memory.

FIGURE 2-1



After the diagnostic program is loaded, the initial choice page will be displayed (FIGURE 2-2).

FIGURE 2-2

PROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN

OPTIONS... 1. To get DEFINITIONS of datasheet items
2. To access a TREATMENT PROGRAM
3. To access the TRAINING PROGRAM
4. To go directly to making a DIAGNOSIS

OPTION:

Selection of either the TREATMENT PROGRAM or the TRAINING PROGRAM will yield an explanation that these programs have not yet been developed and return the user to the initial choice page.

Selection option 1, the DEFINITIONS choice, will yield a list of the symptom cateogires included in the diagnostic program. The user selects a definition, enters the corresponding number and then presses 'RETURN' to have the definition displayed. See Section 2.2 for the definitions.

FIGURE 2-3

PROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN

1.	DURATION OF PAIN	17.	PREV. CHEST PAIN
2.	ONSET OF PAIN	18.	PREV. ILLNESS
3.	TIME COURSE	19.	PREV. SURGERY
4.	SITE OF PAIN	20.	TEMPERATURE
5.	RADIATION	21.	PULSE
6.	NUMBNESS	22.	BLOOD PRESSURE
7.	SEVERITY	23.	MOOD
8.	PROGRESS	24.	COLOR
9.	AGGRAVT. FACTORS	25.	SWEATING
10.	RELIEV. FACTORS	26.	SHIVERING
11.	DYSPNEA	27.	J.V.P.
12.	COUGH	28.	RESP. MOVEMENT
13.	NAUSEA	29.	HEART SOUNDS
14.	VOMITING	30.	PERCUSSION
15.	APPETITE	31.	CHEST SOUNDS
16.	BOWELS	32.	BODY BUILD

WHICH DEFINITION WOULD YOU LIKE :

When the user proceeds to the diagnostic program (Option 4, FIGURE 2-2), two display pages will give brief explanations regarding data entry (FIGURE 2-4) and interpretation of diagnostic probabilities (FIGURE 2-5).

FIGURE 2-4

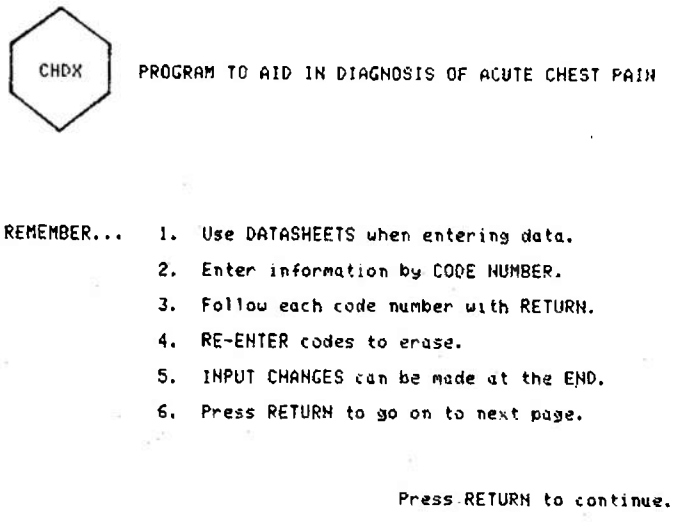
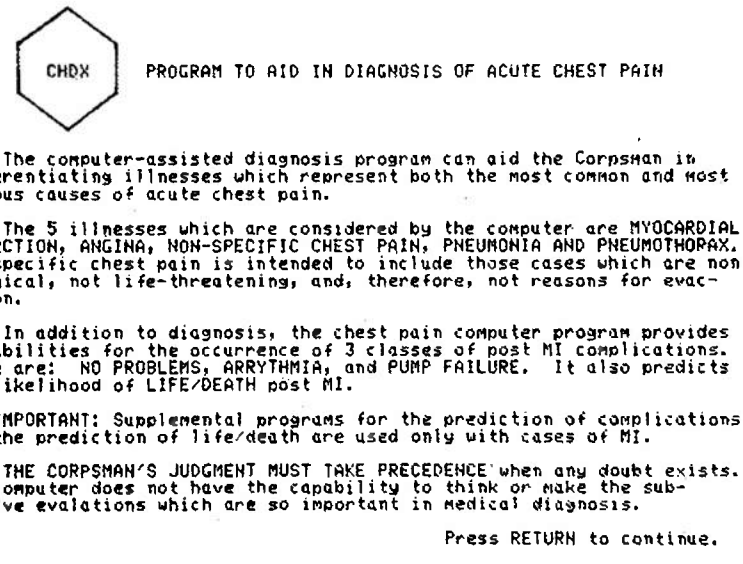


FIGURE 2-5



The user will then be given the option of reviewing the last case. This option is provided as an aid to memory when the course of disease in a patient is being followed over time. The simulation option is a self-instruction program (FIGURE 2-6).

FIGURE 2-6

PROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN

WOULD YOU LIKE TO REVIEW THE LAST CASE?
(Y or N) : N

IS THIS CASE A SIMULATION ?
(Y or N) : N

The program then requests some preliminary information (FIGURE 2-7).

SOCIAL SECURITY NUMBER: the entry must be 11 characters including spaces or dashes between numbers as shown below.

TIME AND DATE: the time and date must be entered in the spaces marked on the display. For example: ____/ __ ___ __ should look like 1400/ 03 Nov 83 after data entry.

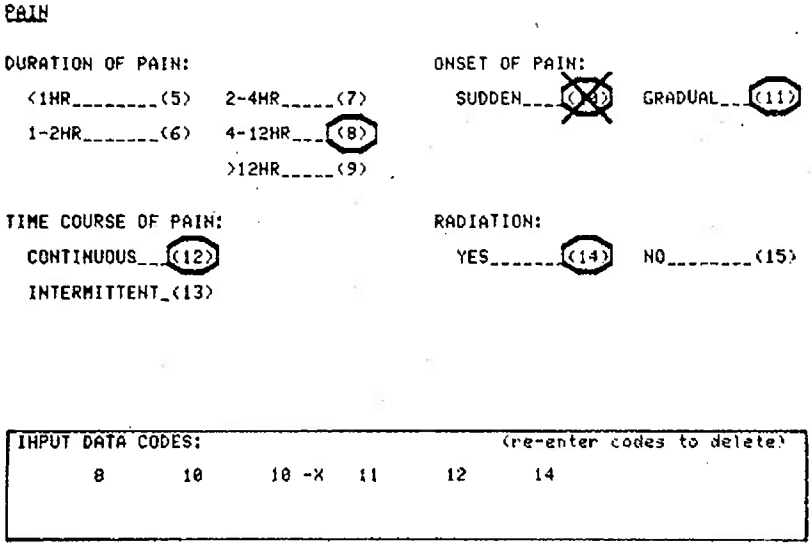
AGE: enter the patient's age. Only ages in the range 10 - 99 are accepted by the program. The data base for submarine use applies only to the ages 17 - 60.

FIGURE 2-7

Enter Patient SSN: 123-45-6789
Enter Time/Day Month Year: 1000 / 30 OCT 83
Enter Patient AGE: 37

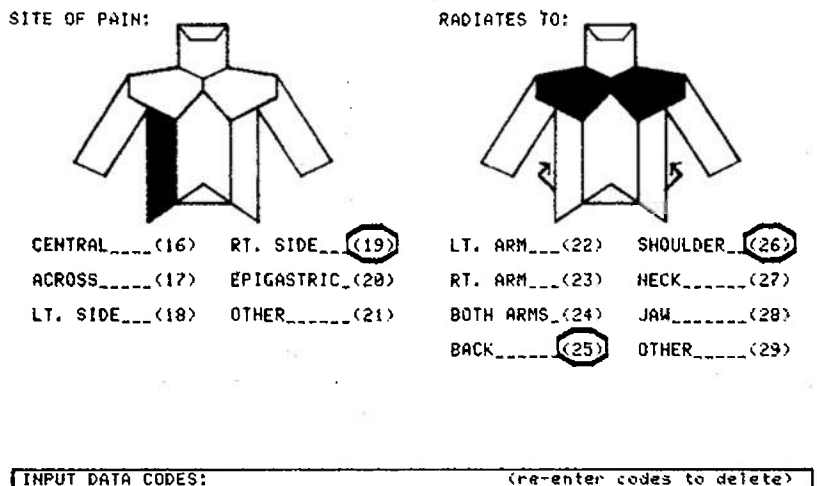
Once the preliminary data have been entered, the computer program sequentially displays each of the 7 data pages. FIGURES 2-8 through 2-14 present the pages with sample entries. To complete the pages, those numbers of the data sheet items recorded during the patient examination are entered on each page as re-presented on the computer display. After a number is entered and 'RETURN' pressed, the symptom is shown as an "input data code" and circled on the screen. If a symptom number is entered in error, re-enter the number and it will be 'X-ed' out, as in FIGURE 2-8, symptom 10, and deleted from memory. When all desired entries have been made on a page, pressing 'RETURN' one more time will erase the screen and display the next page.

FIGURE 2-8



If the display contains diagrams, as in FIGURE 2-9, the appropriate areas are filled-in after the numbers are entered.

FIGURE 2-9



CAUTION: striking the 'RETURN' key two or more times in succession at any time will cause the computer program to step through a corresponding number of displays. The program must be restarted to recover from that error.

FIGURE 2-10

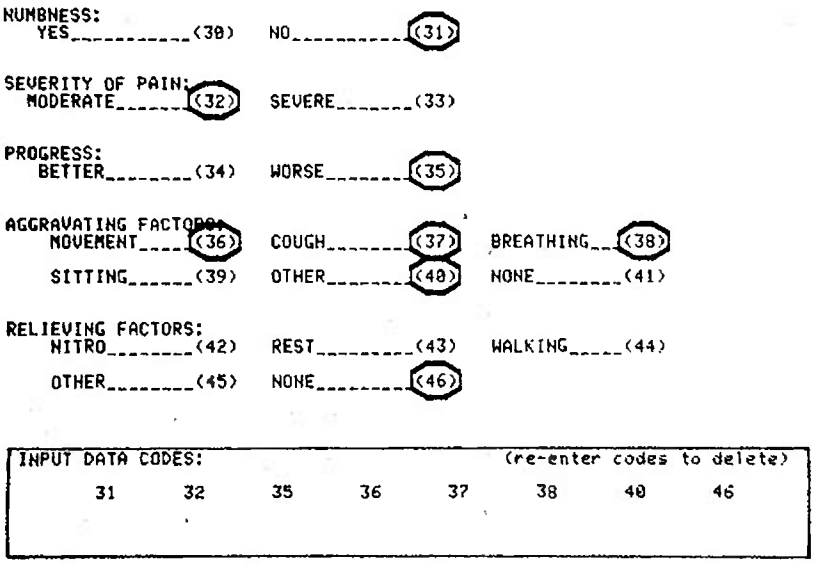
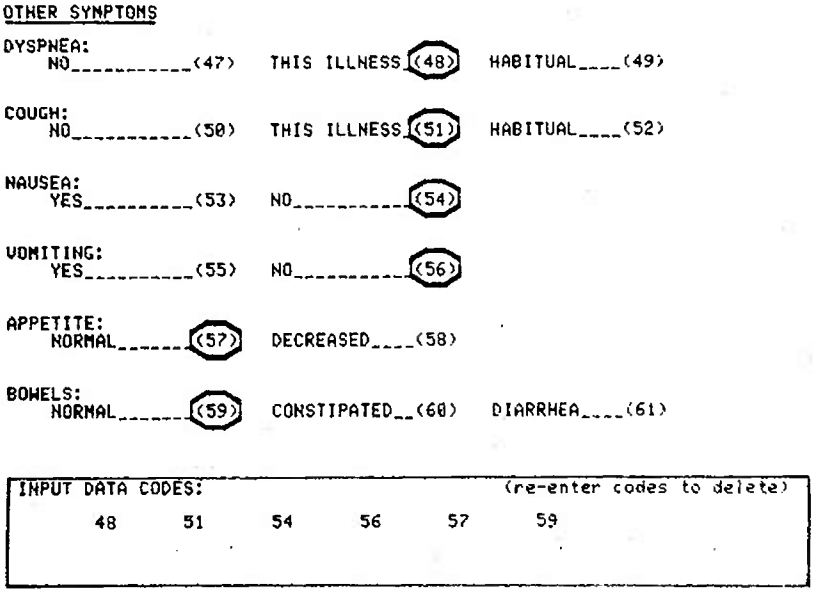
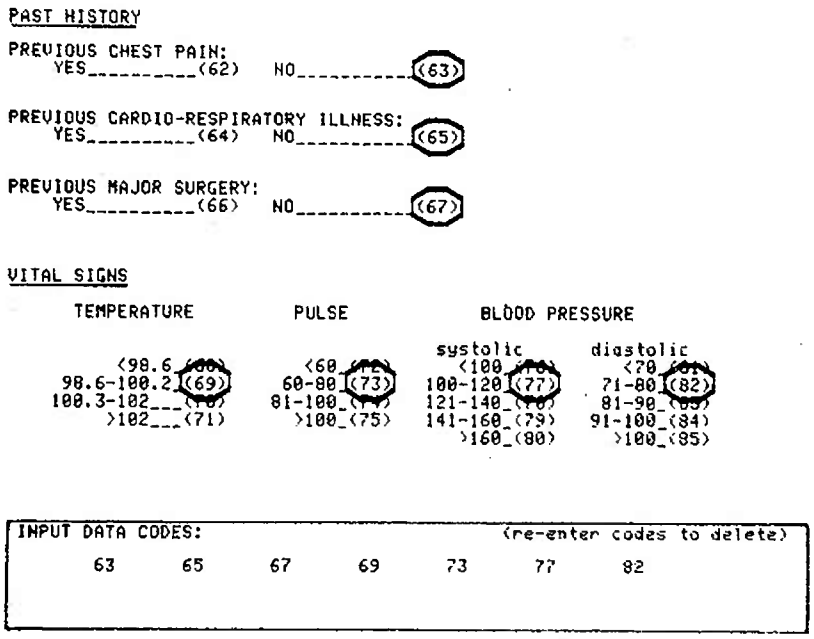


FIGURE 2-11



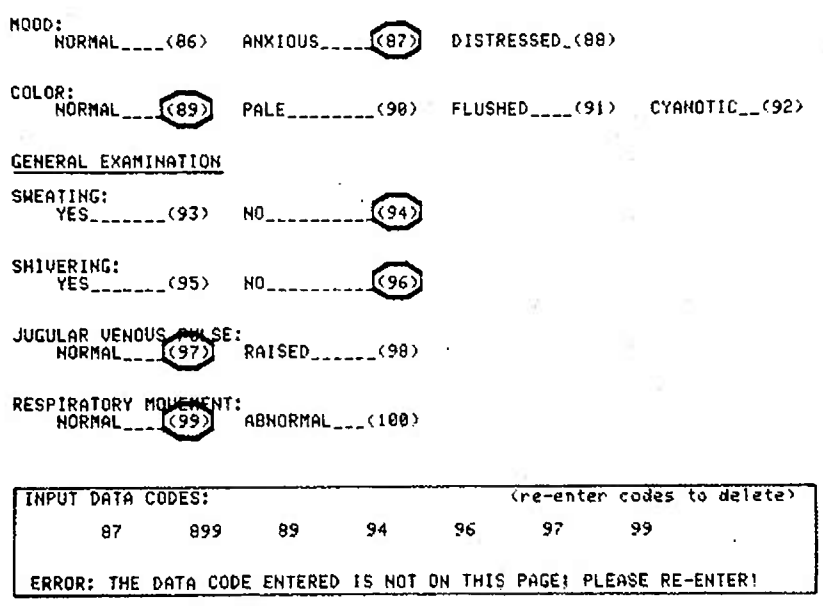
The program has been designed to minimize the effects of keyboard errors by requiring the input to conform to the anticipated format and content of the information requested. When the input is requested in the form of a 'Y' or 'N' reply, typing any other character or number, or more than one character, will elicit another request for the appropriate input. The erroneous entries are discarded by the program.

FIGURE 2-12



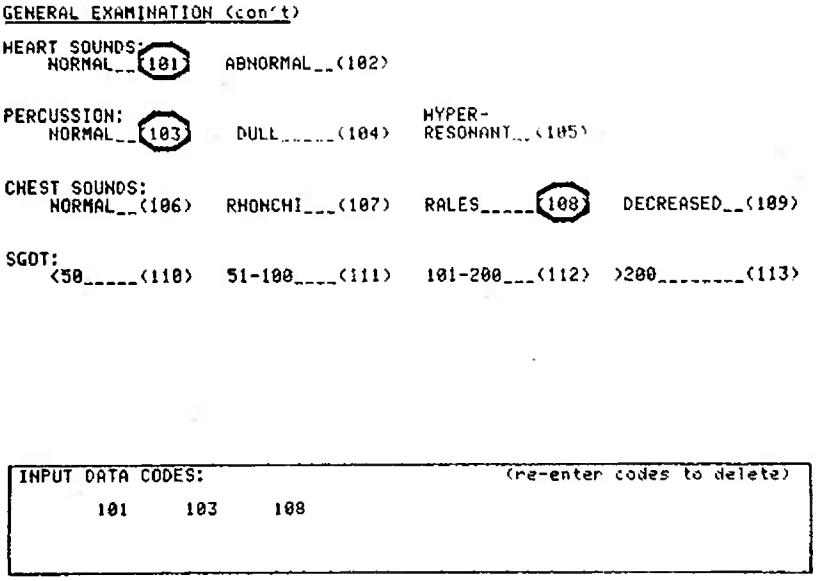
Each number entered must be one of those displayed on the portion of the data sheet represented on the computer screen. Typing any other number will produce a request for one from the set on the screen. For example, the entry 889 shown in FIGURE 2-13 resulted in the error message shown at the bottom of the figure.

FIGURE 2-13



NOTE: The kinds of input errors detected by the program do not affect its computations in any way; those numbers are discarded by the computer before it requests re-entry of a data item. WARNING - Errors in the original record or those made in transcribing that record through the keyboard are not detected by the program. The program accepts any number on the screen.

FIGURE 2-14



When the 'RETURN' is pressed after completion of the 7th page of data input, the program will ask the user to enter his preliminary diagnosis (FIGURE 2-15).

FIGURE 2-15

```
1.  MYOCARDIAL INFARCTION
2.  ANGINA
3.  NON-SPECIFIC CHEST PAIN
4.  PNEUMONIA
5.  PNEUMONTHORAX
6.  OTHER
ENTER THE NUMBER OF YOUR PRELIMINARY DIAGNOSIS : 3

    At this time, the computer-generated probabilities DO NOT AGREE with
your preliminary diagnosis.  However, as of yet, there are no specific
categories which would differentiate your preliminary diagnosis from
the current program-generated diagnosis.

WOULD YOU LIKE TO MAKE ANY CHANGES? (Y or N) :
```

After the user's preliminary diagnosis has been entered, the program compares it with the diagnosis found most probable by the system. The program then tells the user whether the diagnoses agree or not. If the diagnoses are the same, keying 'RETURN' directs the program to construct and display the Case Summary Page. If they are not the same, the user may go on as though the diagnoses agreed, or he may return to any earlier

point in the diagnostic process. In the abdominal pain program, indicants that may differentiate between the Corpsman's diagnosis and the computer's are named. That aid will be built into future versions of the chest pain program. The alternatives include revision of previous entries by responding Y to the prompt, "WOULD YOU LIKE TO MAKE ANY CHANGES." If the user selects 'OTHER' as his preliminary diagnosis, the program merely states that it does not consider any diagnosis other than those listed (in FIGURE 2-15).

FIGURE 2-16 presents the Case Summary Page for the symptoms entered in FIGURES 2-8 through 2-14. The Case Summary Page lists the HISTORY and PHYSICAL EXAM items in separate columns so that the user may review his entries for accuracy one more time. The probabilities of the 5 diagnoses relative to each other are shown below the indicants calculated as percentages. In addition, a bar graph displays the percentages for easy visualization of the program's findings. The time, date and location (unit name) of the examination, the patient's SSN and age are shown at the top of the page. This form can be used as an entry in the patient's health record with addition of the patient's name, the practitioner's name and signature, and the designation 'SF-600'. However, it must be reproduced on a medium more stable than the product of the Tektronix hard copy unit. The latter darkens over time, particularly if exposed to light.

FIGURE 2-16

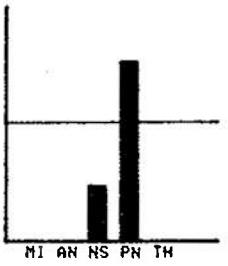
1008 30 OCT 83 PATIENT SSN: 123-45-6789
NAVSUBMEDRSCHLAB AGE: 37

HISTORY:

AGE 30-39
DURATION 4-12HR
ONSET GRADUAL
CONTINUOUS PAIN
RADIATION YES
SITE RT. SIDE
RADIATION TO BACK
RADIATION TO SHOULDER
NO NUMBNESS
PAIN MODERATE
PROGRESS NOW WORSE
MOVEMENT AGGRAVATES
COUGH AGGRAVATES
BREATHING AGGRAVATES
AGGRAVATED BY OTHER
NOTHING RELIEVES
DYSPNEA THIS ILLNESS
COUGH THIS ILLNESS
NO NAUSEA
NO VOMITING
APPETITE NORMAL
BOWELS NORMAL
NO PREVIOUS CHEST PAIN
NO PREVIOUS ILLNESS
NO PREVIOUS SURGERY

PHYSICAL EXAM:

TEMP 98.6-100.2
PULSE 60-80
SYSTOLIC BP 100-120
DIASTOLIC BP 71-80
MOOD ANXIOUS
COLOR NORMAL
NO SWEATING
NO SHIVERING
JVP NORMAL
RESP. MOV. NORMAL
HEART SOUNDS NORMAL
PERCUSSION NORMAL
CHEST SOUNDS RALES



NEXT INTERACTION

1. Change Input Data
2. Another Diagnosis
3. Display Treatment
4. Obtain Definition
5. End interaction

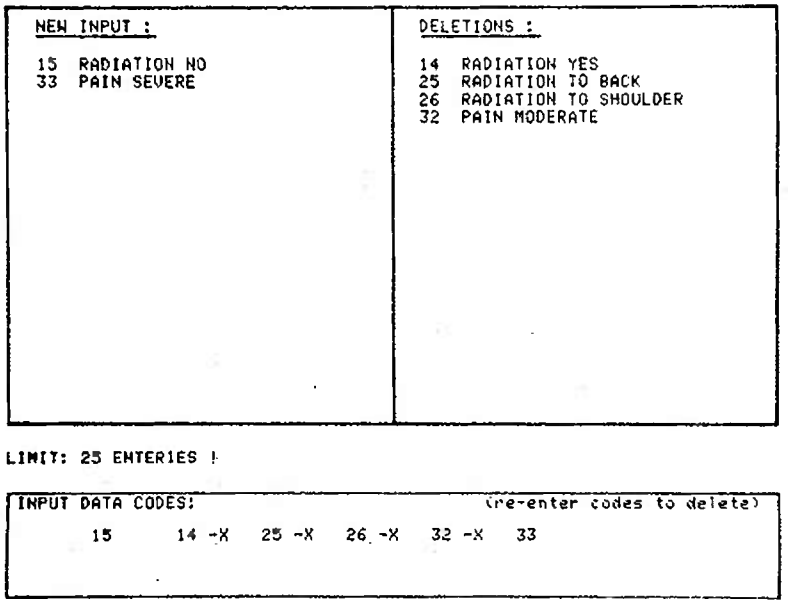
CHOICE:

0.3% M.I.	0.8% ANGINA	23.2% NONSCP	75.9% PNEUMO	0.6% THORAX

The Case Summary Page presents 5 or 6 options for the next interaction to the user. The options are to change some of the input for the present case and request another calculation, to enter a new case, to access the treatment program, to access the item definitions, to enter the cardiac prognosis program, or to end the computer interaction. In its present form, the cardiac prognosis program can be consulted only if the computer ranks Myocardial Infarction as the most probable diagnosis.

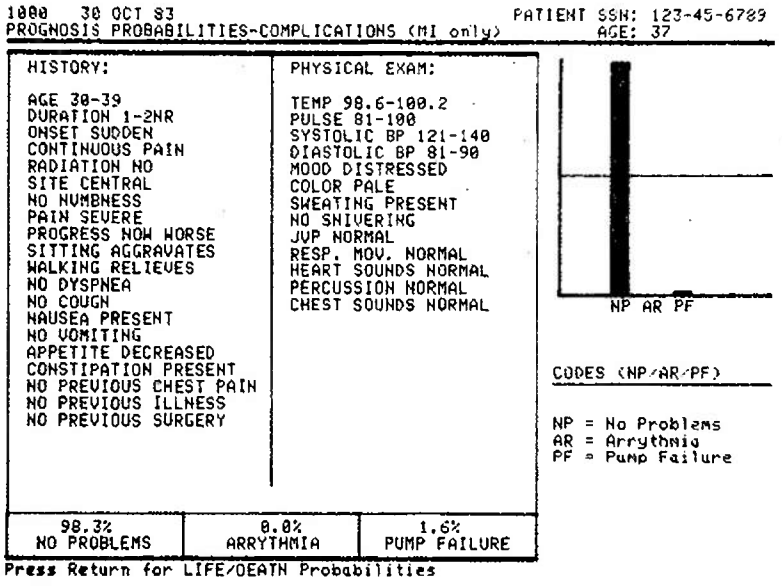
If the user chooses to alter some of the data entries for the present case, FIGURE 2-17 is presented. This option allows deletion of entries by entry of their numbers, as in the main program, and entry of additional numbers to replace those deleted or to add to the information previously supplied to the program. Items added should, of course, be consistent with those already available to the program. As before, keying 'RETURN' after the last item has been entered into the computer results in the construction and display of the new Case Symmary Page. FIGURE 2-17 illustrates the input change routine with some sample entries.

FIGURE 2-17



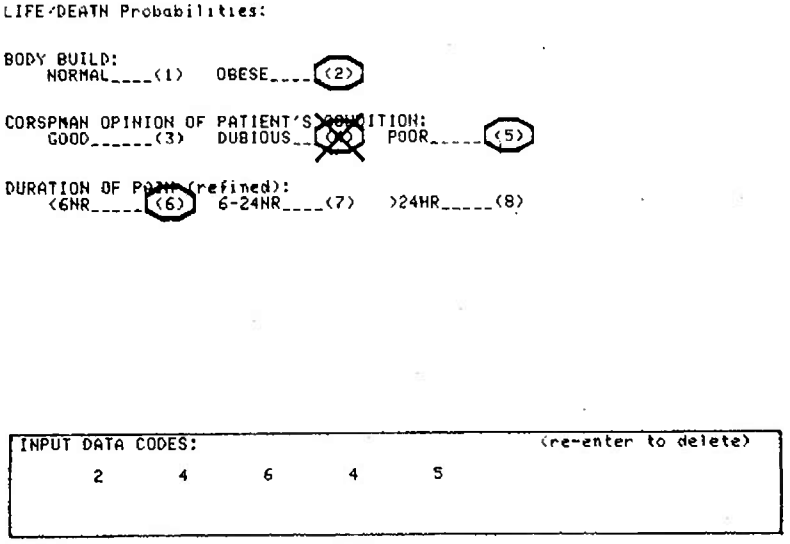
If the PROGNOSIS program option is chosen, the computer calculates probabilities for three kinds of cardiac problems. The prognostic program uses a new database to calculate probabilities for cardiac problems based on the set of symptoms already entered for the patient. Once the probabilities have been computed, the display will present the symptom set and probabilities for: NO PROBLEMS, ARRHYTHMIA, and PUMP FAILURE (FIGURE 2-18).

FIGURE 2-18



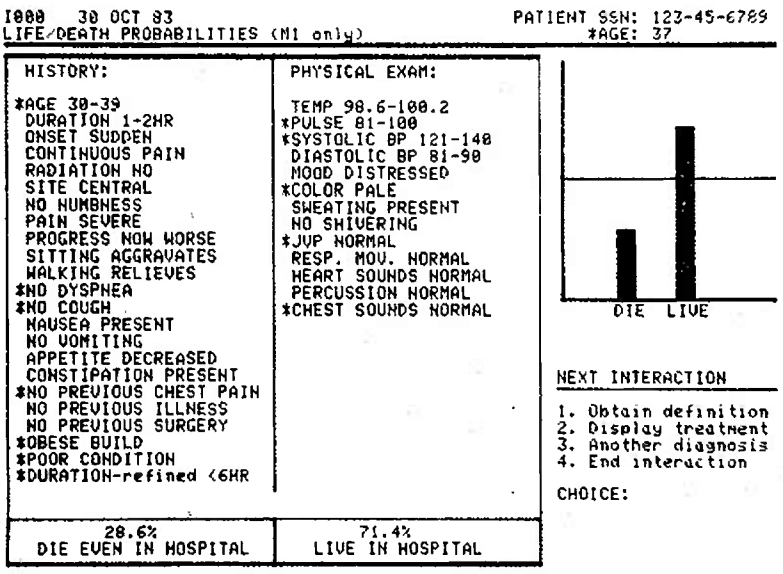
Also included as part of the PROGNOSIS program are probabilities for the likelihood that the patient will either live or die, even if in a hospital setting. For this section of the prognosis program, the computer will ask for additional data input (FIGURE 2-19).

FIGURE 2-19



The program calculates 'LIFE/DEATH' probabilities using a subset of symptoms entered for the patient. FIGURE 2-20 illustrates the Case Summary Page for the 'LIFE/DEATH' section of the prognosis program. Starred symptoms are ones which contribute to the calculation of the probabilities.

FIGURE 2-20



Following the presentation of the 'LIFE/DEATH' probabilities, the user is given four options. They are to obtain a symptom definition, display treatment information, run a new case, or end the interaction with the computer.

2.2 DATA SHEET DEFINITIONS

The following are definitions of chest pain signs and symptoms. The definitions are accessed through the chest pain DIAGNOSIS program.

DURATION OF PAIN definition:

<1HR (5) 1-2HR (6) 2-4HR (7) 4-12HR (8) >12HR (9)

Here we're interested in how long since the pain began for this episode of illness. Record in hours and minutes.

ONSET OF PAIN definition:

SUDDEN (10) GRADUAL (11)

Determine how long it took the pain to develop fully. If it took less than 2 minutes, write SUDDEN; if greater than 2 minutes, write GRADUAL.

TIME COURSE OF PAIN definition:

CONTINUOUS (12) INTERMITTENT (13)

If your patient has had times when he has been free of pain since it started, circle INTERMITTENT. Otherwise circle CONTINUOUS.

SITE OF PAIN definition:

SUBSTERNAL (16) ACROSS (17) LEFT SIDE (18)
RIGHT SIDE (19) EPIGASTRIC (20) OTHER (21)

This is sometimes hard to express. Look at the choices on your data sheet, then get your patient to bare his chest and show you with one finger where his pain is. Choose the data sheet category which fits best.

RADIATION OF PAIN definition:

YES (14) NO (15)
LEFT ARM (22) RIGHT ARM (23) BOTH ARMS (24) BACK (25)
SHOULDER (26) NECK (27) JAW (28) OTHER (29)

Radiation is pain spreading from a primary site (here, the chest) to other areas. Patients often describe this pain as 'moving' or 'shooting' to the area in question. Ask about each of the possible choices on your data sheet.

NUMBNESS definition:

YES (30) NO (31)

This refers to the present illness only. Your patient may describe this as not having sensation or as a 'tingling' in some area.

SEVERITY definition:

MODERATE (32) SEVERE (33)

This is a judgment you make: don't ask your patient. If the pain is obviously intense, causing obvious distress, sweating, or shivering, circle SEVERE. Otherwise circle MODERATE.

PROGRESS definition:

BETTER (34) WORSE (35)

In general, since it began, is the pain getting BETTER or WORSE? If in doubt, leave blank and skip this entry. There is no SAME category.

AGGRAVATING FACTORS definition:

MOVEMENT (36) COUGH (37) RESPIRATION (38)
SITTING (39) OTHER (40) NONE (41)

This means patient activities which make the pain worse. Ask about each of the data sheet items mentioned in a neutral manner, e.g. 'Does X affect your pain?'

RELIEVING FACTORS definition:

NITRO (42) REST (43) WALKING (44)
OTHER (45) NOTHING (46)

This refers to patient activities which ease the pain. Ask about each of the data sheet items in a neutral fashion, e.g. 'Does X affect your pain?'

NITRO is nitroglycerin, a tablet put under the tongue for angina chest pain. Ask about this even though you feel sure your patient has never used any.

DYSPNEA definition:

NO (47) THIS ILLNESS (48) HABITUAL (49)

This is shortness of breath while not engaged in strenuous activity. Ask your patient if he's felt unusually short of breath, especially while resting. Here it is important to distinguish between chronic dyspnea (circle HABITUAL) and dyspnea that has started recently (circle THIS ILLNESS).

COUGH definition:

NO (50) THIS ILLNESS (51) HABITUAL (52)

Here it is important to distinguish between chronic cough (circle HABITUAL) and cough that has started recently (circle THIS ILLNESS).

NAUSEA definition:

YES (53) NO (54)

This means your patient is feeling sick to his stomach. This may be accompanied by weakness, sweating, and profuse salivation.

VOMITING definition:

YES (55) NO (56)

Here the patient is being sick to his stomach with an appreciable amount of stomach contents expelled. This should be distinguished from 'burping' up small amounts of acid material, which is not vomiting.

APPETITE definition:

NORMAL (57) DECREASED (58)

Here we're interested in RECENT change. Your patient may still feel he can eat, but you wish to know if his DESIRE to eat is decreased. If his desire to eat is the same, write NORMAL, otherwise write DECREASED.

BOWELS definition:

NORMAL (59) CONSTIPATED (60) DIARRHEA (61)

Here we're interested in a recent change. If there has been a marked DECREASE in the number of stools, circle CONSTIPATED, if a marked INCREASE circle DIARRHEA (especially if watery). Otherwise circle NORMAL.

PREVIOUS SIMILAR PAIN definition:

YES (62) NO (63)

Check carefully for times in the past when your patient has experienced chest pain. Sometimes incidents are forgotten. Sometimes they have been concealed to avoid a MEDICAL BOARD.

PREVIOUS CARDIO-RESPIRATORY ILLNESS definition:

YES (64) NO (65)

This refers only to a significant illness involving the cardio-vascular or respiratory systems. Ask about, and check his health record for, major illnesses in the past such as high blood pressure, angina, pericarditis, pneumonia, pneumothorax, pulmonary embolism, asthma.

PREVIOUS MAJOR SURGERY definition:

YES (66) NO (67)

This refers to major surgery of any kind. Ask about, and check health records for, major surgery in the past.

TEMPERATURE definition:

<98.6 (68) 98.6-100.2 (69) 100.3-102 (70) >102 (71)

This is self-explanatory. Use oral temperature. Ensure that your patient has not drunk hot or cold liquids during the 15 minutes prior to your measurement.

PULSE definition:

<60 (72) 61-80 (73) 81-100 (74) >100 (75)

Enter the pulse rate in beats per minute. Feel the radial or carotid pulse for one full minute. If you detect irregularities such as extra beats, count the number of times this happens in a minute. (The computer only uses the pulse rate, but you want to be aware if your patient has arrhythmia.)

BP (Blood Pressure) definition:

SYSTOLIC BP:
<100 (76) 101-120 (77) 121-140 (78) 141-160 (79) >160 (80)

DIASTOLIC BP:
<70 (81) 71-80 (82) 81-90 (83) 91-100 (84) >100 (85)

Self-explanatory. Write down the Systolic and Diastolic pressures.

MOOD definition:

NORMAL (86) ANXIOUS (87) DISTRESSED (88)

Don't attempt deep psychoanalysis here. If your patient is obviously reacting to great pain or other severe symptoms, circle DISTRESSED. If he's mainly agitated and worried, circle ANXIOUS. Otherwise circle NORMAL.

COLOR definition:

NORMAL (89) PALE (90) FLUSHED (91) CYANOTIC (92)

Check especially for pallor (unusual absence of color), flushing (unusual ruddiness), or cyanosis (blueness). In whites, check the face and ears. In blacks and whites, check also the extremities and mucus membranes, e.g. nailbeds, nose, lips, conjunctivae.

SWEATING definition:

YES (93) NO (94)

Self-explanatory. We assume that the sweating is not due to an obvious cause such as hot compartment or heavy exercise.

SHIVERING definition:

YES (95) NO (96)

Self-explanatory. We assume that the shivering is not due to a cold compartment.

J.V.P. (Jugular Venous Pulsation) definition:

NORMAL (97) RAISED (98)

Standing on your patient's right, have your patient reclining at a 45° angle, his chin turned about 30 degrees to the left, with a light shining at an angle across his neck so that his right neck vein casts a shadow. It is important to distinguish the pulsation of the external jugular vein from the cartoid artery pulse. This can be accomplished by pressing lightly but firmly against the vein at the base of the neck; the vein pulsation will be stopped by this maneuver while the arterial pulsation will not be (since artery pressure is higher).

With the patient in this position and the JVP identified, check in the following way: if the meniscus is seen more than one half of the distance from the clavicle to the chin, circle ELEVATED. Otherwise circle NORMAL. If you're not sure, omit this entry.

An elevated JVP often indicates heart failure.

RESPIRATORY MOVEMENT definition:

NORMAL (99) ABNORMAL (100)

Here we check the amount and pattern of chest expansion. Check for two things.

A) At the level of the nipples measure the amount of chest expansion with a tape measure or string. If the difference between full inspiration and full expiration is less than 2 inches, circle ABNORMAL (don't draw the tape tightly enough to push in on the skin).

B) Inspect and palpate with both hands whether expansion is equal on both sides. If obviously different, circle ABNORMAL.

HEART SOUNDS definition:

NORMAL (101) ABNORMAL (102)

With the diaphragm of your stethoscope listen carefully to the first and second heart sounds (LUB-DUB, LUB-DUB). If you can hear anything else or if the heart is irregular, circle ABNORMAL. Otherwise circle NORMAL.

Sometimes changing your patient's position makes auscultation easier: have him sit up, lean forward, lie back, etc., as needed.

Also, in young, healthy men the heart can slow and speed with respiration. This is called sinus arrhythmia, and is NORMAL.

PERCUSSION definition:

NORMAL (103) DULL (104) HYPER-RESONANT (105)

Be sure to carefully percuss both the front and back of the chest. The best method is to compare sides as you go, left with right. If the sides don't sound the same, there is probably an abnormality. The lungs should normally sound somewhat resonant. If an area sounds markedly less resonant than normal, circle DULL; if an area is markedly more resonant than normal, circle HYPER-RESONANT, otherwise circle NORMAL.

With regard to comparing sides, note than when percussing anteriorly right and left are normally different in two areas: 1) dullness should be present to the left of the lower sternum over the heart and 2) when percussing below the level of the xiphoid (tip of the sternum) there is usually dullness to the patient's right (liver) and tympany to the patient's left (over the stomach). So compare only those areas above the level of the sternum and not over the level of the heart.

CHEST SOUNDS definition:

NORMAL (106) RHONCHI (107) RALES (108) DECREASED (109)

Listen with the diaphragm of your stethoscope to your patient's back. Have him breathe deeply through his mouth and compare right and left sides. If one side is markedly decreased, write DECREASED.

Rales are discrete, non-continuous (crackling) sounds produced by moisture in airways of the lung. Fine rales sound like the rubbing of a lock of hair between your fingers near your ear. Rales are usually heard late in inspiration. If you suspect heart failure, fine rales should be checked for by listening to the lung bases (about 2 finger widths below each scapula) and having your patient cough, then breathe deeply. Courser rales can be heard elsewhere in the lung in conditions such as pneumonia.

Rhonchi are continuous, musical sounds that range from high-pitched wheezes to lower-pitched moaning. Rhonchi can be both inspiratory and expiratory although they are often more prominent in expiration. They can be heard anywhere over the lungs. Rhonchi are usually heard with infections such as bronchitis or pneumonia, or with airway spasm (asthma).

If breath sounds are not markedly decreased, and if there are no added sounds, write NORMAL.

SGOT definition:

<50 (110) 50-100 (111) 101-200 (112) >200 (113)

Serum Glutamic Oxaloacetic Transaminase was the first enzyme to be widely used as a laboratory diagnostic aid. It begins to rise 12 hours post injury, peaks at 2-4 times normal at 24 hours, and returns to normal in 4-7 days. It is also released from an injured liver and other cells and is thus a sensitive but non-specific indicator. The current terminology is "AST" or aspartate transferase. Facilities for measurement may not be available at sea.

2.3 CHEST PAIN DATASHEET

The chest pain data sheet (FIGURE 2-21) provides the practitioner with a guide to use in performing the history and physical examination and in collecting data from the patient. It consists of 21 history items, including age, and 13 physical exam categories. The findings on these categories are used by the computer pgoram to arrive at a diagnosis. The datasheet pages displayed by the diagnostic program correspond to the format of the paper and pencil datasheet.

In addition to the symptom categories used by the diagnostic program, the chest pain datasheet also includes 3 symptom categories (Body build, Duration of pain (refined, Examiner's opinion of the patient's condition), which are used by the computer program to arrive at a prognosis for patients whose initial computer diagnosis is MYOCARDIAL INFARCTION. These terms are defined on the datasheet; they are not included in the items defined by the section of the program described on pages 14-20.

FIGURE 2-21

CHEST PAIN DATA SHEET

PATIENT NAME: I. R. SYCK AGE: 37

SSN: 123-45-6789 DATE/TIME: 30 OCT 83 1000

HISTORY

PAIN

DURATION OF PAIN:
(duration of this episode of pain)
<1HR (5) 2-4HR (7)
1-2HR (6) 4-12HR (8)
>12HR (9)

ONSET OF PAIN:
(sudden < 2 Min; gradual > 2 Min)
SUDDEN (10) GRADUAL (11)

TIME COURSE OF PAIN:
(at times free of pain = intermittent; everything else = continuous)
CONTINUOUS (12)
INTERMITTENT (13)

RADIATION:
(pain other than in chest area)
YES (14) NO (15)

SITE OF PAIN:
(have the patient point with one finger to where the pain is)

RADIATES TO:
(location of radiated pain; ask about each)

SUBSTERNAL (16) RT. SIDE (19)
ACROSS (17) EPIGASTRIC (20)
LT. SIDE (18) OTHER (21)

LT. ARM (22) SHOULDER (26)
RT. ARM (23) NECK (27)
BOTH ARMS (24) JAW (28)
BACK (25) OTHER (29)

NUMBNESS:
(this illness only; absence of sensation or a tingling feeling)
YES (30) NO (31)

SEVERITY OF PAIN:
(do not ask; obvious distress = severe; everything else = moderate)
MODERATE (32) SEVERE (33)

PROGRESS OF PAIN:
(general trend of pain rather than short-term changes)
BETTER (34) WORSE (35)

AGGRAVATING FACTORS:
(factors which make the pain worse; ask & perform each unless ? MI)
MOVEMENT (36) COUGH (37) BREATHING (38)
SITTING (39) OTHER (40) NONE (41)

RELIEVING FACTORS:
(activities which ease the pain; ask about each)
NITRO (42) REST (43) WALKING (44)
OTHER (45) NONE (46)

OTHER SYMPTOMS

DYSPNEA:
(shortness of breath; recent = this illness, chronic = habitual)
NO (47) THIS ILLNESS (48) HABITUAL (49)

COUGH:
(recent cough = this illness; chronic cough = habitual)
NO (50) THIS ILLNESS (51) HABITUAL (52)

NAUSEA:
(feeling sick to stomach)
YES (53) NO (54)

VOMITING:
(being sick to stomach)
YES (55) NO (56)

APPETITE:
(recent change in appetite)
NORMAL (57) DECREASED (58)

BOWELS:
(recent change in bowel habits)
NORMAL (59) CONSTIPATED (60) DIARRHEA (61)

PAST HISTORY

PREVIOUS CHEST PAIN:
(pain like this before)
YES (62) NO (63)

PREVIOUS CARDIO-RESPIRATORY ILLNESS:
(significant illness either cardiovascular or respiratory)
YES (64) NO (65)

PREVIOUS MAJOR SURGERY:
(major surgery of any kind)
YES (66) NO (67)

PHYSICAL EXAM

VITAL SIGNS

TEMPERATURE	PULSE	BLOOD PRESSURE	
		systolic	diastolic
<98.6 (68)	<60 (72)	<100 (76)	<70 (81)
98.6-100.2 (69)	60-80 (73)	100-120 (77)	70-80 (82)
100.3-102 (70)	81-100 (74)	121-140 (78)	81-90 (83)
>102 (71)	>100 (75)	141-160 (79)	91-100 (84)
		>160 (80)	>100 (85)

MOOD:
(don't ask; obvious distress or physical symptoms = distressed; just worried about illness = anxious)
NORMAL (86) ANXIOUS (87) DISTRESSED (88)

COLOR:
(consider environmental temp.; check conjunctiva & palms on black & oriental)
NORMAL (89) PALE (90) FLUSHED (91) CYANOTIC (92)

EXAMINATION

SWEATING:
(check for sweating not due to environment or exercise)
YES (93) NO (94)

SHIVERING:
(check for shivering not due to environment; e.g. cold compartment)
YES (95) NO (96)

JUGULAR VENOUS PULSE:
(pt. reclined at 45 degrees, chin 30 degrees to left; meniscus more than ½ of the distance from clavicle to chin = elevated; otherwise circle normal)
NORMAL (97) RAISED (98)

RESPIRATORY MOVEMENT:
(abnormal = the difference between full inspiration & full expiration is less than 2 inches or expansion is unequal between sides; otherwise circle normal)
NORMAL (99) ABNORMAL (100)

HEART SOUNDS:
(with a stethoscope listen to the 1st and 2nd heart sounds; normal = lub-dub, lub-dub; abnormal = everything else)
NORMAL (101) ABNORMAL (102) (PVC'S____ S_3/S_4____)

PERCUSSION:
(percuss both front & back; dull = less resonant than normal; hyper-resonant = markedly more resonant than normal; otherwise circle normal)
NORMAL (103) DULL (104) HYPER-RESONANT (105)

CHEST SOUNDS:
(compare left to right sides; rhonchi = continuous musical sounds; rales = discrete, non-continuous sounds; decreased = one side markedly decreased)
NORMAL (106) RHONCHI (107) RALES (108) DECREASED (109)

SGOT:
(enzyme test)
<50 (110) 50-100 (111) 101-200 (112) >200 (113)

BODY BUILD:
(obviously overweight = obese; otherwise circle normal)
NORMAL (114) OBESE (115)

DURATION OF PAIN (REFINED):
(complete this item only for repeated examinations of the patient)
<6HR (116) 6-24HR (117) >24HR (118)

EXAMINER'S OPINION OF THE PATIENT'S CONDITION:
(how sick do you feel the patient is)
GOOD (119) FAIR (120) POOR (121)

CORPSMAN'S DIAGNOSIS:
(mark your diagnosis)
( ) MYOCARDIAL INFARCTION
( ) ANGINA
( ) NONSPECIFIC CHEST PAIN
( ) PNEUMONIA
( ) PNEUMOTHORAX
( ) OTHER (specify)

M.O.'S DIAGNOSIS:
(mark your diagnosis)
( ) MYOCARDIAL INFARCTION
( ) ANGINA
( ) NONSPECIFIC CHEST PAIN
( ) PNEUMONIA
( ) PNEUMOTHORAX
( ) OTHER (specify)

EXAMINING CORPSMAN: _____

EXAMINING M.O.: _____

2.4 DIAGNOSTIC CATEGORIES:

The diagnostic program is intended to specifically diagnose four of the most common and the most serious causes of chest pain in the submarine population. These categories are: acute myocardial infarction (M.I.), angina (ANGINA), pneumonia (PNEUMO), and pneumothorax (THORAX).

In addition, a fifth category termed nonspecific chest pain (NONSCP) is intended to include those conditions which are vague and general in nature and which are amenable to symptomatic treatment. Occasionally, the practitioner will pinpoint a "specific" diagnosis (i.e., esophagitis) in this category, but in all cases NONSCP is intended to encompass those conditions which are non-life-threatening and not a reason for medical evacuation.

There are several causes of acute chest pain (pulmonary embolism, pericarditis, aortic dissection) which are not included in the above categories, yet are of a serious nature. The program will yield the diagnosis of the category which most closely reflects the sign/symptom complex of a serious illness for which there is no specific category. Thus, the practitioner must utilize his clinical judgment both when gathering and entering the data and when interpreting the results of his computer interaction. A discussion of each diagnostic category is presented below.

SPECIFIC DIAGNOSES -

A. MYOCARDIAL INFARCTION : Myocardial infarction (M.I.) is a leading cause of mortality and morbidity in the population of the western, affluent civilization. In the United States, the annual incidence is approximately 1,000,000 cases weighted towards a middle age or older age group. Pre-hospital mortality approaches 50%. M.I. is acute necrosis of myocardium secondary to a sudden interruption or decrease of blood supply. Major risk factors are hypertension, hyperlipidemia, and smoking. Diabetes and angina are related risk factors unlikely to be present in the submarine population.

A history of acute onset of crushing substernal chest discomfort radiating to the left arm and accompanied by diaphoresis, nausea, and a sense of impending doom is classic. The pain lasts longer than 20 minutes and is unrelieved by rest and nitroglycerin. Physical exam ranges from near-normal to obvious shock. An electrocardiogram (ECG) taken early in the course is abnormal less than 50% of the time, but may show ST elevation, T wave inversion, or left ventricular hypertrophy. Q waves appear later. Cardiac enzyme determinations may be helpful but are unavailable at sea. Variations in the presentation are legion and well-documented. Diagnosis must be made on clinical grounds incorporating risk factors, the history and physical exam, the ECG (if available), and the practitioner's impression of the patient's overall condition.

B. ANGINA : Relative myocardial ischemia from an imbalance in myocardial oxygen supply versus demand is believed to be the basis for angina pectoris. Risk factors are the same as for M.I. Angina (ANGINA) is commonly described as substernal chest pain, pressure, tightness, or burning sensation that may radiate to the left arm (or elsewhere). The discomfort is relieved within 1-5 minutes of resting and/or by nitroglycerin.

The physical exam is usually normal. Cardiac examination, during an episode of pain, may reveal an S_3, a mitral regurgitant murmur, or a systolic bulge that disappears as the pain subsides. The ECG is usually normal but may show ST depression which later resolves. Cardiac enzymes are normal, although such testing is unavailable at sea.

Diagnosis is made on the assessment of risk factors, the history and physical exam, the ECG (if available), and the response to rest and nitroglycerin.

Variant or "rest" angina, also known as Prinzemetal's angina, is due to coronary artery spasm. There is a good response to nitroglycerin but not to rest. The ECG may show transient ST elevation.

Recurrent and frequent episodes of angina may be a harbinger of impending M.I. The episodes may occur given less cardiopulmonary stress and be less responsive to rest and nitroglycerin than typical episodes.

C. PNEUMONIA : Pneumonia (PNEUMO) is an alveolar infection caused by a bacterium, virus, or other non-bacterial pathogen. Pneumococcal (bacterial) pneumonia is most likely in the isolated case. Mycoplasma (non-bacterial) or viral pneumonia is more common when groups of people are ill. Chest pain as a component of pneumonia is due to pleuritic or bronchial irritation. The pain may be felt anywhere in the thorax and is exacerbated by coughing or deep breathing. The "pleuritic component" to the pain distinguishes it from M.I. or ANGINA. Additionally, pneumonia is characterized by coexisting or recent upper respiratory tract symptoms, malaise, fever, chills, and sputum production. Dyspnea, tachypnea, and tachycardia may be present.

Physical exam reveals varying degrees of vocal fremitus, egophony, dullness to percussion, rhonchi, and rales. These signs are worse with bacterial pneumonia.

A lung infiltrate is usually visible on chest roentgenogram, but this study is unavailable aboard ship. The white blood cell count is elevated in bacterial pneumonia, but near-normal or depressed otherwise. Mycoplasma pneumonia is common in young adults and varies from the milder illness of a viral pneumonia to the more serious bacterial pneumonia. A right lower lobe pneumonia will occasionally present as abdominal discomfort in a younger person. A compatible history and rales in the lung field, that do not clear with cough, are the best indicators of the presence or absence of pneumonia.

D. PNEUMOTHORAX : Pneumothorax (THORAX) involves a degree of collapse of a lung secondary to entrance of air into the potential space between visceral and parietal pleura. Spontaneous pneumothorax develops de novo from rupture of an existing pulmonary bleb or occurs during respiratory infection. Cough or another mechanism whereby intra- alveolar pressure is elevated may be a precipitating factor. Penetrating chest trauma and rib fracture are other causes.

There is an acute onset of chest discomfort on the side of the pneumothorax, with a pleuritic quality to the discomfort. Dyspnea, tachypnea and cyanosis may be present with a large pneumothorax.

Physical exam reveals absent breath sounds and hyper-resonance overlying the pneumothorax. The trachea may be deviated away from the affected side. There is no fever or accompanying respiratory infection, unless pre-existent. Subcutaneous emphysema may be present in the chest wall or neck area if the parietal pleura is torn.

The pneumothorax is visible on chest roentgenogram, although this study is unavailable on a submarine. White blood cell count is normal unless there is acute distress, whereupon it might be elevated moderately. Occasionally, a "one-way valve" effect exists leading to the life-threatening tension pneumothorax. Usually, the non-tension pneumothorax stabilizes within a few minutes.

NON-SPECIFIC CHEST PAIN -

Non-specific chest pain (NONSCP) is intended to encompass those disorders which are not serious and not a cause for medical evacuation. Pain in this category is often more annoying than worrisome to patients. This aspect is helpful in diagnosis.

The likelihood of chest pain being due to non-specific causes varies with the age of the patient and clinical circumstances of the case. In a young adult without previous or recent medical illness, a serious cause for chest pain is unlikely.

Non-specific causes for chest pain include: a) musculoskeletal pain; b) costochrondritis (Tietze's syndrome); c) esophagitis; d) esophageal spasm ("esophageal angina"); e) hyperventilation syndrome; f) psychoneurotic disorder; g) epigastric lesions (cholelithiasis, peptic ulcer, etc.).

Musculoskeletal pain and costochondritis denote muscle, rib, or cartilage pain due to inflammation or trauma. The pain is often sharp, of moderate intensity, localized to the chest wall, and reproduced by direct manipulation of the affected area.

Esophagitis and esophageal spasm are felt substernally in the mid-chest and/or epigastrium. Esophagitis is caused by direct irritation from food or drink, by reflux of gastric contents, or by infection (the latter is uncommon in healthy people). There is a good response to liquid antacids, a fact which assists in diagnosis. Esophageal spasm may follow a meal and is accompanied by dysphagia. The pain is relieved by nitroglycerin, making differentiation from classic angina difficult. The concommitant dysphagia and lack of relationship to exercise may be helpful in diagnosis.

Hyperventilation syndrome is a relatively common cause of chest discomfort in an (already) anxious person. The accompanying breathlessness, palpitations, weakness, and response to re-breathing techniques are diagnostic.

In psychoneurotic disorders no physical etiology for chest pain is found. This diagnosis is best made by those skilled in psychiatric evaluation. It should be assumed that crewmembers with chest pain have a physical etiology for chest pain.

Disorders that present with epigastric pain such as gastritis, peptic ulcer, pancreatitis, and cholelithiasis may occasionally be confused with chest pain disorders. In most of these disorders, the abdominal exam is revealing -- any abdominal tenderness points to a non-chest source of the pain. The key issue is to avoid overlooking an atypical presentation of M.I. The assessment of risk factors, the history and physical exam (chest and abdominal), and the ECG (if available) are helpful in this regard.

SECTION 3 - PROGRAMMING DETAILS

3.1 THE DIAGNOSTIC PROGRAM

The chest pain tape is composed of two related programs: the diagnostic program and the prognostic program. The diagnostic program elements will be discussed in this section, and the prognostic program elements will be discussed in section 3.2.

The diagnostic program contains one main program (Program 10) and two small introductory programs which serve only to automatically lead the user into Program 10 when the tape is loaded.

The first page of program 10 is the initial option page from which the user may proceed to obtain datasheet definitions, treatment displays, the training program, or the diagnostic program.

If the datasheet definition pathway is chosen, once the user specifies the definition desired, the program searches for file 9 and accesses the definition desired by reading each definition as binary data until the appropriate definition is reached. Once read, the definition is displayed and, if a graphic display accompanies the definition, the appropriate display is produced by program 10. The program flow then returns to the original decision point.

The treatment suggestions and training programs do not yet exist. If either of these options are selected, the program will display a statement to this effect and return the user to the initial option page.

If the diagnostic interaction is chosen, program 10 finds the file (11) which contains the data entry reminders and summary page and serially displays them. The program loads the database and all variables are set to their initial values. The program continues on from this point as described in Section 2.

On the following pages each program (both data and programming) is reproduced with some programming notes to aid in understanding the flow of the program. Table 3-1 lists the programs as they are stored on the tape and in the order in which they will be discussed.

TABLE 3-1 PROGRAM LISTINGS FOR CHEST PAIN TAPE

PROGRAM NUMBER	TYPE OF PROGRAM	TAPE LENGTH	PROGRAM CONTENTS
1	ASCII PROGRAM	768	ASCII INTRODUCTION
2	BINARY PROGRAM	2048	INTRODUCTORY PAGE
3	NEW	6912	EMPTY (TREATMENT DISPLAYS)
4	NEW	3840	EMPTY (TREATMENT DISPLAYS)
5	NEW	7680	EMPTY (TREATMENT DISPLAYS)
6	NEW	3328	EMPTY (TREATMENT DISPLAYS)
7	BINARY PROGRAM	8704	PROGNOSTIC PROGRAM
8	BINARY DATA	10752	PROG. PROB. & DISPLAY PROGRAM
9	BINARY DATA	14080	DATASHEET DEFINITIONS
10	BINARY PROGRAM	19712	DIAGNOSTIC PROGRAM
11	BINARY DATA	8448	ENTRY REMIN, SUMMARY, DATABASE
12	BINARY DATA	4096	DISPLAY PAGES
13	BINARY DATA	768	LAST CASE
14	BINARY DATA	7424	DATAFILE
15	BINARY DATA	7424	DATAFILE
16	BINARY DATA	7424	DATAFILE
17	BINARY DATA	7424	DATAFILE
18	BINARY DATA	7424	DATAFILE
19	BINARY DATA	7424	DATAFILE
20	BINARY DATA	7424	DATAFILE
21	BINARY DATA	7424	DATAFILE
22	BINARY DATA	7424	DATAFILE
23	BINARY DATA	7424	DATAFILE
24	BINARY DATA	7424	DATAFILE
25	BINARY DATA	7424	DATAFILE
26	BINARY DATA	7424	DATAFILE
27	BINARY DATA	7424	DATAFILE
28	LAST	728	LAST PROGRAM

PROGRAM 1 - ASCII INTRODUCTION

This program is used only to load program 2, the BINARY PROGRAM introductory page. The ASCII introductory page is required by the computer software to enable loading of BINARY programs.

CHEST PAIN PROGRAM 1 ASCII INTRODUCTION

```
10  FIND 2
20  CALL "BOLD"
30  RUN
40  END
```

PROGRAM 2 - INTRODUCTORY PAGE

This program, automatically loaded and executed when the tape is inserted and "AUTOLOAD" is keyed, displays the Introductory Page and automatically accesses, loads, and executes the main diagnostic program, program 10.

CHEST PAIN PROGRAM 2 INTRODUCTORY PAGE

```
100 REM:  THIS WILL PRINTOUT THE FIRST PAGE
110 PRINT USING "P,6L,27X,FA":"SUBMARINE CORPSMAN␣"
120 PRINT USING "18X,FA":"COMPUTER-ASSISTED DIAGNOSIS PROGRAM␣"
130 PRINT USING "34X,FA":"FOR␣"
140 PRINT USING "30X,FA":"CHEST PAIN"
150 PRINT @32,21:29,60.4
160 PRINT @32,20:29,88,99.5,88,99.5,60.4,29,60.4,26,57.4,26,91,29,88
170 PRINT @32,20:26,91,102.5,91,99.5,88,102.5,91,102.5,57.4
180 PRINT @32,20:99.5,60.4,102.5,57.4,26,57.4
190 PRINT @32,21:80.2,37.3
200 PRINT @32,20:76,37.2,74.2,36.8,73,36,72.2,35,72,34,71.8,32,72.2,30.8
210 PRINT @32,20:72.8,29.8,74,28.8,76.5,28,80,28,85,28.4,89,29.2,92,30.3
220 PRINT @32,20:92.8,28.8,93.5,29,94.1,31.7,93.8,32.3,96.2,32.3
230 PRINT @32,20:94.5,32.5,95.5,33.4,95.3,34,94,33.3,93.7,36.5,93,36.8
240 PRINT @32,20:92.3,35.2,91,35,89.8,35.2,88,35.8,86.3,36.2,85.6,39
250 PRINT @32,20:83.4,39,86.5,39.3,89,39,87.8,39.5,85.3,40,85.1,41.1
260 PRINT @32,20:83,41.7,82,41.8,81,41.2,80.8,39.7,78,40,78,39.6
270 PRINT @32,20:80.4,38.8,80.2,37.3
280 PRINT USING "5/,FA":"␣␣␣␣␣␣␣␣␣Developed by:"
290 PRINT "␣NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY"
300 PRINT "Box 900              SUBASE, NLON_GROTON, CONNECTICUT     06349"
310 PRINT "Phone:   (203) 449-3668, 4894_          Autovon 241-3668, 4894"
320 FIND 10
330 CALL "bold"
340 END
```

PROGRAMS 3-6 SPACE ALLOCATED FOR TREATMENT DISPLAYS

Programs 3-6 are currently empty. These files allocate space for the inclusion of chest pain treatment regimes.

PROGRAM 7 - PROGNOSTIC PROGRAM
PROGRAM 8 - PROGNOSTIC PROBABILITIES DISPLAY PAGES

Programs 7 and 8 pertain to the prognostic program. These program elements will be disucssed in Section 3.2.

PROGRAM 9 - DATASHEET DEFINITIONS

Program 9 contains the datasheet definitions stored as BINARY DATA in order of their appearance on the datasheet and definition selection display. The data strings are sequentially read until the desired definition string is accessed and the string is then automatically printed. The graphic display contained in the "CHEST SOUNDS" definition is constructed by the main diagnostic program.

In total, there are 32 definition strings. Age, as usual, is taken to the last birthday. In addition, there are no definitions for symptom categories pertaining only to the prediction of prognosis (Body build, Duration of pain (refined), and Examiner's opinion of the patient's condition).

The reader is asked to refer to Section 2.2 for a complete listing of datasheet definitions.

PROGRAM 10 - DIAGNOSTIC PROGRAM

The following pages list the main diagnostic program and highlight some of the important programming features. The line demarcations below serve to aid in the understanding of program organization.

LINES	FUNCTION
100 - 700	Display and choose initial choice, read in all initial displays and databases
1000 - 1379	Begin diagnostic interaction, 'last case', input patient's personal data
1400 - 1440	Display datasheet pages including grahics
3000 - 3640	Data input routine
4010 - 4590	Preliminary diagnosis comparison routine
4620 - 4800	Reconstruct 'last case' from memory (J$)
5000 - 6000	Case summary page construction
6010 - 6310	Entry of case into 'last case' file and datafile
6320 - 6340	Treatment files not yet created
7010 - 7280	Input change routine, GOSUB data input subroutine
8000 - 8200	Graphics to circle and 'X' data entries
9000 - 10030	Display definition choices, add graphics to 'Chest Sounds' definition
12000 - 15540	Draws graphics for page 2 of datasheet
16000 - 16090	Underlines major headings on datasheet pages

Sets initial dimensions

Reads in database and definition headings

Display page heading

Display initial options

Option choice and validity check

Space to access training programs

Space to access treatment programs

Display entry reminders

Display summary page

Sets dimensions of diagnostic variables

Inputs unit name, case counter and last case memory string

START DIAGNOSTIC PROGRAM set initial variable values

Last case choice

Validity check

SSN entry and validity check

```
100 INIT
101 SET KEY
102 DIM B$(5500),A$(1650),D$(1610),Z$(180),F$(104)
103 Y$="0"
104 FIND 11
106 READ @33:B$,B$,B$,D$
108 GOSUB 120
110 GO TO 170
120 PRINT USING "P,6/,10T,4A":"CHDX"
130 PRINT "KIPROGRAM TO AID IN DIAGNOSIS OF ACUTE CHEST PAIN"
140 PRINT @32,21:19.2,93
150 PRINT @32,20:11.2,87,11.2,79,19.2,73,27.2,79,27.2,87,19.2,93
152 IF Y$<>"4" THEN 155
153 PRINT @32,21:0,70
154 GO TO 160
155 PRINT @32,21:0,60
160 RETURN
170 PRINT "JJ      OPTIONS...   1. To get DEFINITIONS of datasheet ite";
180 PRINT "ms IJ 2. To access a TREATMENT PROGRAM IJ 3. To access the ";
190 PRI "TRAINING PROGRAM IJ 4. To go directly to making a DIAGNOSISJJJ"
200 PRINT "I OPTION: GGGG";
210 INPUT Y$
220 IF LEN(Y$)<>1 THEN 200
230 IF ASC(Y$)<49 OR ASC(Y$)>52 THEN 200
240 GO TO VAL(Y$) OF 9000,270,245,380
245 GOSUB 120
250 PRINT "ITRAINING PROGRAMS DO NOT EXIST YET."
260 GO TO 10000
270 GOSUB 120
280 PRINT "ITREATMENT PROGRAMS DO NOT EXIST YET."
285 GO TO 10000
380 GOSUB 120
390 FIND 11
400 READ @33:A$
410 PRINT A$
420 READ @33:A$
450 INPUT Z$
460 GOSUB 120
465 PRINT
470 PRINT A$
480 Y$="0"
630 DIM B(5),P(114),P1(5),P2(5),Q(8),G(113)
640 DIM J$(180),N$(50),O$(2),R$(2),S$(12),T$(17),Y$(4),K$(16)
670 FIND 13
680 READ @33:N$,Q,J$
690 PRINT "JII          Press RETURN to continue. ";
700 INPUT Z$
1000 RESTORE 1010
1010 DATA 1,1,1,1,1,1,4,5,"N",0
1020 READ P1,L,H,N,R$,C3
1030 P=0
1040 GOSUB 120
1050 PRINT "IWOULD YOU LIKE TO REVIEW THE LAST CASE?J"
1060 PRINT "IG          (Y or N) : ";
1070 INPUT R$
1080 IF R$="N" OR R$="n" THEN 1170
1090 IF R$<>"Y" AND R$<>"y" THEN 1060

1100 PRINT "J"
1110 PRINT "IENTER PATIENT SSN : G";
1120 INPUT S$
1130 IF LEN(S$)<>11 THEN 1110
1140 GO TO 4620
```

Simulation choice and validity check

```
1170 PRINT "_JJJJJIIS THIS CASE A SIMULATION ?J"
1180 PRINT "IG          (Y or N) : ";
1190 INPUT O$
1200 IF O$<>"Y" AND O$<>"y" AND O$<>"N" AND O$<>"n" THEN 1180
```

SSN entry and validity check

```
1210 PRINT USING "p,12/,22t,fa,s":"GEnter Patient SSN: "
1220 INPUT S$
1230 IF LEN(S$)<>11 THEN 1210
```

Time/date entry and validity check

```
1240 PRI "JIHHHHHGEnter Time/Day Month Year: ____ / __ ___ __KII    ";
1250 INPUT T$
1260 IF LEN(T$)<>16 THEN 1240
```

Age entry and validity check

```
1270 PRINT USING "1,22t,fa,s":"GEnter Patient AGE: "
1280 INPUT Z$
1290 IF LEN(Z$)<1 OR LEN(Z$)>2 THEN 1270
1300 IF VAL(Z$)<1 OR VAL(Z$)>99 THEN 1270
1310 IF LEN(Z$)=1 THEN 1340
1320 Y$=SEG(Z$,2,1)
1330 IF ASC(Y$)<48 OR ASC(Y$)>57 THEN 1270
1340 Y$=SEG(Z$,1,1)
1350 IF ASC(Y$)<48 OR ASC(Y$)>57 THEN 1270
1360 A=VAL(Z$)
1370 Z=ABS(INT(A/10-1)) MIN 4
```

(goes to data input subroutine)

```
1375 IF Z=2 OR Z=3 OR Z=4 THEN 3270
1377 Z=1
1379 GO TO 3270
```

Reads and displays datasheet pages

```
1400 FIND 12
1420 FOR I9=1 TO 7          A$ = Datasheet page display
1425 READ @33:A$,L,H        L  = Lowest symptom # on the page
1430 PRINT A$               H  = Highest symptom # on the page
```

Calls for diagrams for page 2

```
1432 GOSUB 16000
1435 IF I9=2 THEN 12000
1440 GO TO 3000
```

START DATA ENTRY SUBROUTINE

```
3000 PRINT @32,21:0,18
3020 PRINT @32,20:130,18,130,0,0,0,0,18
3030 PRINT "J INPUT DATA CODES:I          (re-enter codes to delete)";
```

E & F = coordinates for next input in entry box
C = entry counter

```
3033 E=0
3034 F=9.5
3040 C=0
3050 C=C+1
```

Spaces entries in entry box

```
3055 MOVE E,F
3060 IF C<>9 AND C<>17 THEN 3080
3070 PRINT
3080 PRINT "        GG";
3090 GIN E,F
```

SYMPTOM #'s INPUT

```
3100 INPUT Z$
3120 GO TO LEN(Z$)+1 OF 3530,3230,3210,3190
```

Checks input and displays error message

```
3130 FOR K=1 TO 5
3140 PRINT @32,21:3,1
3150 PRI "GERROR: THE DATA CODE ENTERED IS NOT ON THIS PAGE; PLEASE RE";
3160 PRINT "~ENTER!K"
3170 NEXT K
3180 GO TO 3050
```

Validity check

```
3190 Y$=SEG(Z$,3,1)
3200 IF ASC(Y$)<48 OR ASC(Y$)>57 THEN 3150
3210 Y$=SEG(Z$,2,1)
3220 IF ASC(Y$)<48 OR ASC(Y$)>57 THEN 3150
3230 Y$=SEG(Z$,1,1)
3240 IF ASC(Y$)<48 OR ASC(Y$)>57 THEN 3150
3250 Z=VAL(Z$)
3260 IF Z<L OR Z>H THEN 3130      (Out of range check)
```

Access conditional probabilities

```
3270 FOR I=1 TO 5
3280 Z$=SEG(B$,3389+2*I+(Z-1)*10,2)
3290 B(I)=VAL(Z$)
3300 NEXT I
```

Flow directors	3320 IF L=5 AND H=113 THEN 7190 3330 IF P(Z)=1 THEN 3450 3350 IF Z<5 THEN 3410
(to enter graphics)	3400 GOSUB 8000
Calculates running probabilities	3410 P(Z)=1 3412 FOR I=1 TO 5 3414 P1(I)=P1(I)*B(I) 3415 NEXT I
Total number of entries counter	3418 C3=C3+1 3420 GO TO 3510
	3450 GOSUB 8000 3460 MOVE E,F 3465 PRINT " -X"
REENTRY ROUTINE - resets P(?) to 0 and recalculates probabilities	3470 P(Z)=0 3480 FOR I=1 TO 5 3490 P1(I)=P1(I)/B(I) 3500 NEXT I 3505 C3=C3-1
Flow directors	3510 IF Z<5 THEN 1400 3520 GO TO 3050 3530 IF H=113 THEN 3560 3550 NEXT I9
Calculates final probabilities	3560 FOR I=1 TO 5 3570 P2(I)=P1(I)/SUM(P1)*100 3580 NEXT I
Checks for highest probability	3600 P3=1 3610 FOR I=2 TO 5 3620 IF P2(P3)>P2(I) THEN 3640 3630 P3=I 3640 NEXT I
	4010 IF H=113 AND L=5 THEN 5000 4020 IF R$="Y" OR R$="y" THEN 5000
Displays choices for clinician's preliminary diagnosis	4030 PRINT "LI1. MYOCARDIAL INFARCTION_I2. ANGINA_I3. NON-SPECIFIC "; 4040 PRINT "CHEST PAIN_I4. PNEUMONIA_I5. PNEUMONTHORAX_I6. OTHER" 4060 PRINT "ENTER THE NUMBER OF YOUR PRELIMINARY DIAGNOSIS : "; 4070 INPUT Z$
Verify input	4080 IF LEN(Z$)<>1 THEN 4060 4090 IF ASC(Z$)<49 OR ASC(Z$)>55 THEN 4060 4100 P(114)=VAL(Z$) 4110 IF P(2)<6 THEN 4190
Input and display for "other diagnosis" routine	4120 PRINT "JJENTER NAME OF OTHER DIAGNOSIS : "; 4130 INPUT Z$ 4140 PRINT "JJJThe CHEST PAIN program does not consider this disease "; 4150 PRINT "in the differ-_ential diagnosis of acute chest pain.JJJJJJ" 4155 PRINT "JJJJ" 4160 PRINT "JJJJJIIHPress RETURN for `CASE SUMMARY PAGE'"; 4170 INPUT Z$ 4180 GO TO 5000
Does not agree routine	4190 IF P(114)=P3 THEN 4560 4194 PRINT @32,21:0,64 4200 PRINT " At this time, the computer-generated probabilities D"; 4210 PRINT "O NOT AGREE with_your preliminary diagnosis.JJJJJ" 4400 PRINT @32,21:52,61.57 4500 PRINT "However, as of yet, there are no specific_categories whic"; 4510 PRI "h would differentiate your preliminary diagnosis from_the cu"; 4520 PRINT "rrent program-generated diagnosis.IIIJJJJJJJJJJJJJJJ"
Change option	4530 PRINT "_WOULD YOU LIKE TO MAKE ANY CHANGES? (Y or N) : GG"; 4540 INPUT Z$ 4542 IF Z$="Y" OR Z$="y" THEN 7010
Diagnoses agree	4550 GO TO 5000 4560 PRI "JJJJJThe program-generated probabilities AGREE with your pro" 4570 PRI "visional_diagnosis._JJJJPress RETURN for `CASE SUMMARY PAGE'" 4580 INPUT Z$ 4590 GO TO 5000

Reconstructs last case

```
4620 T$=SEG(J$,1,16)
4630 O$=SEG(J$,17,1)
4640 FOR K=18 TO 130
4650 Y$=SEG(J$,K,1)
4660 IF ASC(Y$)=0 THEN 4710
4670 P(K-17)=1
4710 NEXT K
4720 Y$=SEG(J$,131,1)
4730 A=ASC(Y$)
4740 FOR I=1 TO 5
4750 Y$=SEG(J$,I+131,1)
4760 P2(I)=ASC(Y$)
4770 NEXT I
```

```
4800 GO TO 3600
```

Constructs case summary page

```
5000 PRINT "L",T$,"IIHHHHHHPATIENT SSN: ";S$;N$;"III  AGE: ";A
5020 PRINT @32,21:0,95
5030 PRINT @32,20:130,95,103,94.75,0,94.75,0,94.5,130,94.5
5040 PRINT @32,21:0,8
5050 PRINT @32,20:0,93,90,93,90,92.8,0,92.8,0,92.6,45,92.6,45,20,45,92.6
5060 PRINT @32,20:90,92.6,90,7,0,7,0,15,18,15,18,7,18,15,36,15
5070 PRINT @32,20:36,7,36,15,54,15,54,7,54,15,72,15,72,7,72,15,90,15
5080 PRINT @32,20:90,7,90,15,75,15,90,15,90,7.2,0,7.2,0,7.4,90,7.4
5090 PRINT @32,21:0,89
5100 PRINT "  HISTORY:I          PHYSICAL EXAM:J"
```

Display history symptoms

```
5110 FOR I=1 TO 67
5120 IF P(I)=0 THEN 5160
5140 Z$=SEG(B$,30*(I-1)+1,30)
5150 PRINT "  ";Z$
5160 NEXT I
```

Display physical symptoms

```
5170 PRINT @32,21:0,83
5180 FOR I=68 TO 113
5190 IF P(I)=0 THEN 5220
5200 Z$=SEG(B$,30*(I-1)+1,30)
5210 PRINT USING "28T,FA":Z$
5220 NEXT I
```

Simulated case note (if needed)

```
5230 IF O$="N" OR O$="n" THEN 5260
5240 PRINT @32,21:32.8,15.7
5250 PRINT "SIMULATED CASE"
```

Prints out %'s for each diagnosis

```
5260 PRINT @32,21:2.4,11.5
5270 IMAGE 4D.1D,"%",6D.1D,"%",8D.1D,"%",7D.1D,"%",7D.1D,"%"
5280 PRINT USING 5270:P2(1),P2(2),P2(3),P2(4),P2(5)
5290 PRINT "    M.I.    ANGINA     NONSCP     PNEUMO     THORAX"
```

Draws bargraph

```
5300 PRINT @32,21:93,37.2
5310 PRINT @32,20:130,37.2
5320 PRINT @32,21:94,92
5330 PRINT @32,20:94,52,130,52,130,52.3,94.2,52.2,94.2,92
5340 PRINT @32,20:94,72,130,72
5350 PRINT @32,21:97.5,49
5360 PRINT "MI AN NS PN TH"
```

Draws bargraph bars

```
5370 FOR I=1 TO 5
5380 IF P2(I)<1 THEN 5440
5390 PRINT @32,21:97.4+(I-1)*5.4,52
5400 FOR K=0 TO 2.64 STEP 0.33
5410 PRINT @32,20:97.4+(I-1)*5.4+K,52+P2(I)*0.4
5420 PRINT @32,20:97.6+(I-1)*5.4+K,52+P2(I)*0.4,97.6+(I-1)*5.4+K,52
5430 NEXT K
5440 NEXT I
```

Display next choice
/ / / / / / / / / / / / / /
Display prognosis option if M.I. probability is highest

```
5450 PRINT " JJJJIIIHHNEXT INTERACTION _JIIIHH1. Change Input Data_III";
5460 PRINT "HH2. Another Diagnosis_IIIHH3. Display Treatment";
5461 PRINT " IIIHH4. Obtain Definition_IIIHH";
5462 IF P3<>1 THEN 5468
5463 PRINT "5. Prognosis Program_IIIHH";
5464 PRINT "6. End Interaction"
5466 GO TO 5470
5468 PRINT "5. End interaction"
5470 PRINT "_IIIHHCHOICE:  G";
5480 INPUT Y$
5482 K$=T$
```

Verify entry

```
5490 IF LEN(Y$)<>1 THEN 5470
5500 IF ASC(Y$)<49 OR ASC(Y$)>54 THEN 5470
```

Flow directors

```
5510 IF Y$="1" THEN 7010
5520 IF Y$="4" THEN 9000
6000 IF O$="Y" OR O$="y" THEN 6040
```

Update case counter

```
6010 Q(7)=Q(7)+1
6020 Q(P3)=Q(P3)+1
6030 GO TO 6050
6040 Q(8)=Q(8)+1
```

Construct case memory

```
6050 J$=T$&O$
6060 FOR I=1 TO 113
6070 T$=CHR(P(I))
6080 J$=J$&T$
6090 NEXT I
6100 T$=CHR(A)
6110 J$=J$&T$
6120 FOR I=1 TO 5
6130 T$=CHR(INT(P2(I)))
6140 J$=J$&T$
6150 NEXT I
6160 T$=CHR(P3)
6170 J$=J$&T$
6180 J$=J$&R$
6185 T$=CHR(P(114))
6186 J$=J$&T$
```

1-16 = Time/date
17 = Simulated or real choice (Y or N)
18-130 = symptom array
131 = Patient's age
132-136 = Individual probabilities
137 = # of diagnosis with highest %
138 = Last case recalled (Y or N)
139 = Corpsman's provisional diagnosis
140-147 = Symptom array for additional info

```
6188 IF Y$="5" AND P3=1 THEN 11000
6189 J$=J$&"00000000"
```

Saves unit name, case counter, last case and Dx multiples

```
6190 FIND 13
6200 WRITE N$,Q,J$
6210 CLOSE
```

Access appropriate datafile and writes case memory string onto the end

```
6215 IF Q(7)+Q(8)>560 THEN 6280
6220 FIND 14+INT((Q(7)+Q(8))/40)
6230 ON EOF (0) THEN 6260
6240 READ @33:Z$
6250 GO TO 6240
6260 WRITE J$
6270 CLOSE
```

Flow directors

```
6275 IF Y$="5" AND P3<>1 THEN 6290
6280 GO TO VAL(Y$)-1 OF 1000,6320,11000,11000
6290 GOSUB 120
6300 PRINT "JJJJIREMOVE TAPE"
6310 END
6320 GOSUB 120
6330 PRINT "ITREATMENT FILE NOT YET INCLUDED IN PROGRAM.J"
6340 GO TO 170
```

Subroutine for changes

```
7010 L=5
7020 H=113
7030 PRINT "LJ   NEW INPUT :II   DELETIONS :"
7040 PRINT @32,21:0,100
7050 PRINT @32,20:130,100,130,30,65,30,65,100,65.2,100,65.2,30,0,30
7060 PRINT @32,20:0,99.8,129.8,99.8,129.8,29.8,0.2,29.8,0.2,99.8
7070 PRINT @32,20:0.2,99.7,129.9,99.8,129.9,30.1,0.1,30.1
7080 PRINT @32,21:5,95
7090 PRINT @32,20:25,95
7100 PRINT @32,21:70,95
7110 PRINT @32,20:90,95
7120 PRINT @32,21:0,23
7130 FOR I=1 TO 10
7140 PRINT "LIMIT: 25 ENTERIES !K"
7150 NEXT I
7160 U=90
7170 W=90
7180 GO TO 3000
7190 Z$=SEG(B$,30*(Z-1)+1,30)
7200 IF P(Z)=1 THEN 7250
7210 PRINT @32,21:0,U-1
7220 PRINT USING "5D,2X,FA":Z,Z$
7230 U=U-3
7240 GO TO 3410
7250 PRINT @32,21:0,W-1
7260 PRINT USING "41D,2X,FA":Z,Z$
7270 W=W-3
7280 GO TO 3460
```

Graphics to cricle data entries

```
8000 Z$=SEG(B$,4941+(Z-4)+(Z-5)*3,1)
8020 V=ASC(Z$)
8030 Z$=SEG(B$,4941+(Z-4)+(Z-5)*3+1,1)
8040 V=V+ASC(Z$)/100
8050 Z$=SEG(B$,4941+(Z-4)+(Z-5)*3+2,1)
8060 W=ASC(Z$)
8070 Z$=SEG(B$,4941+(Z-4)+(Z-5)*3+3,1)
8080 W=W+ASC(Z$)/100
8090 IF P(Z)=1 THEN 8170
8100 FOR K=1 TO 3
8110 W=W+0.25
8120 PRINT @32,21:V-3.4,W-0.65
8130 PRINT @32,20:V-3.4,W+1.85,V-0.9,W+3.35,V+2.1,W+3.35,V+4.6,W+1.85
8140 PRINT @32,20:V+4.6,W-0.65,V+2.1,W-2.15,V-0.9,W-2.15,V-3.4,W-0.65
8150 NEXT K
8155 IF Z=>16 AND Z<=29 THEN 13000
8160 RETURN
8170 PRINT @32,21:V+0.4,W+1
8180 PRI @32,20:V+4.4,W+5,V+4.6,W+4.8,V-3.2,W-3.1,V-3.4,W-2.9,V+0.4,W+1
8190 PRI @32,20:V-3.4,W+4.8,V-3.2,W+5,V+4.6,W-2.9,V+4.4,W-3.1,V+0.4,W+1
8200 RETURN
```

Display 16 definition catagories

```
9000 GOSUB 120
9010 FOR I=1 TO 16
9020 A$=SEG(D$,I*18-17,18)
9030 Z$=SEG(D$,(I+16)*18-17,18)
9040 PRINT USING "9D,FA,2X,FA,10X,4D,FA,2X,FA":I,".",A$,I+16,".",Z$
9050 NEXT I
9060 I=33
9070 A$=SEG(D$,33*18-17,18)
9080 PRINT USING "44D,FA,2X,FA":I,".",A$
9090 PRINT "JJ"
9100 PRINT "       WHICH DEFINITION WOULD YOU LIKE : ";
```

Input definition choice

Validation check

Access definition data file and read requested one

Graphics for definition of chest sounds

Flow directors

Graphics for page 2 of data sheet (draws thorax, neck and chin)

```
9110 INPUT Z$
9120 IF LEN(Z$)<1 OR LEN(Z$)>2 THEN 9100
9130 IF LEN(Z$) THEN 9160
9140 A$=SEG(Z$,2,1)
9150 IF ASC(A$)<48 OR ASC(A$)>57 THEN 9100
9160 A$=SEG(Z$,1,1)
9170 IF ASC(A$)<48 OR ASC(A$)>57 THEN 9100
9180 C=VAL(Z$)
9190 FIND 9
9200 FOR I=1 TO C
9210 READ @33:A$
9220 NEXT I
9230 PRINT A$
9240 IF C<>32 THEN 10000
9250 PRINT @32,21:18.4,32.25
9260 FOR I=4.6 TO 23.6 STEP 0.2
9270 PRINT @32,20:I*4,(SIN(I)+2.65)*8+19
9280 NEXT I
9285 RESTORE 9420
9290 FOR L=1 TO 3
9300 FOR I=1 TO 7
9310 GOSUB 9410
9320 PRINT @32,21:J,K
9330 PRINT "."
9340 NEXT I
9350 RESTORE 9420
9360 NEXT L
9370 GO TO 10000
9380 PRINT @32,21:0,46
9390 PRINT USING "8X,FA,35X,FA":"Rales-","-Inspiration"
9400 PRINT USING "4/,54x,fa":"-Expiration"
9410 READ J,K
9420 DATA 25.75,45,28,47,26.75,47,27.5,46,27,45.5,26.5,46,28.5,47.5
9430 GO TO L OF 9440,9450,9470
9440 RETURN
9450 J=J+25
9460 RETURN
9470 J=J+50
9480 RETURN
10000 PRINT @32,21:82,0
10010 PRINT "Press RETURN to continue.^"
10020 INPUT Z$
10030 IF Y$="1" OR Y$="2" OR Y$="3" THEN 108
10040 GO TO 5000
10050 END
11000 DELETE 100,10050
11010 FIND 7
11020 CALL "link",100
11030 END
12000 RESTORE 12010
12002 T=0
12004 MOVE 27,90
12005 FOR I=1 TO 36
12007 READ A1,B1
12008 RDRAW A1,B1
12009 NEXT I
12010 DATA 8,0,0,-7,8,-1.5,9,-13.75,-5,-2.5,-7,10.75,0,-18,-9,6
12020 DATA -9,-6,0,18,-7,-10.75,-5,2.25,9,14,8,1.5,0,7
12030 DATA 2,-2.5,4,0,2,2.5,0,-7,-4,-2,-4,2,-8,-1.5,0,-3.5
12040 DATA 7.5,-3.75,0,-13.25,0,13.25,4.5,4.75,0,2,0,-2,4.5,-4.75
12050 DATA 0,-13.25,-9,0,9,0,0,13.25,7.5,3.75,0,3.5
12060 IF T=1 THEN 12110
12070 MOVE 93.5,90
12080 RESTORE 12010
12090 T=1
12100 GO TO 12005
12110 GO TO 3000
```

Flow directors for graphics to fill in site of pain and radiation

```
13000 IF Z=21 OR Z=29 THEN 8160
13002 Z1=Z-15
13005 IF Z1>9 THEN 13009
13008 GO TO Z1 OF 13015,13070,14010,14090,15050,13060,15155,15100,15100
13009 Z2=Z1-9
13010 GO TO Z2 OF 15400,15210,15330,15375
```

Substernal

```
13015 PRINT @32,21:31,79
13020 FOR M=0.25 TO 5 STEP 0.25
13030 PRINT @32,20:35.75-M,74.5-M,35.75-M,60.75+M,31,63.75+M
13040 PRINT @32,20:26.25+M,60.78+M,26.25+M,74.25,31,79.25-M
13050 NEXT M
13060 GO TO 14000
13070 PRINT @32,21:22,64
13072 FOR M=0.25 TO 5.25 STEP 0.25
13073 PRINT @32,20:21.75+M,70.25-M,40.25-M,70.25-M
13074 PRINT @32,20:40.25-M,63.75+M,21.75+M,63.75+M
13075 NEXT M
14000 RETURN
```

Left side

```
14010 PRINT @32,21:35.5,74.25
14020 FOR M=0 TO 3.25 STEP 0.25
14030 PRINT @32,20:40-M,76-M,40-M,58+M,35.5+M,61+M
14050 PRINT @32,20:35.5+M,74.25-M
14060 NEXT M
14080 RETURN
```

Right side

```
14090 PRINT @32,21:22,58
15000 FOR M=0 TO 3.25 STEP 0.25
15010 PRINT @32,20:22+M,76-M,26.5-M,74.25-M,26.5-M,61+M
15020 PRINT @32,20:22+M,58+M
15030 NEXT M
15040 RETURN
```

Epigastric

```
15050 PRINT @32,21:31,64
15060 FOR M=0 TO 3 STEP 0.25
15070 PRINT @32,20:35.5-M,61,26.5+M,61,31,64-M
15080 NEXT M
15090 RETURN
```

Right arm

```
15100 PRINT @32,21:85.5,81.5
15110 FOR M=0 TO 6.75 STEP 0.25
15120 PRINT @32,20:85.5-M/2,78-M,85.5,78-M,88.5-M/5,76,81.5-M/5,65.25+M
15130 PRINT @32,20:76.5+M,67.5+M,85.5,81.5-M
15140 NEXT M
15145 IF Z=24 THEN 15155
15150 RETURN
```

Left arm

```
15155 PRINT @32,21:109.5,81.5
15160 FOR M=0 TO 5.5 STEP 0.25
15170 PRINT @32,20:118.5-M,67.5,113.5+M/4,65.25+M,106.5+M,76.75-M
15180 PRINT @32,20:109.5+M/12,78-M/12,109.5,81.5-M/5
15185 NEXT M
15200 RETURN
```

Shoulders

```
15210 PRINT @32,21:85.5,81.5
15220 FOR M=0 TO 6 STEP 0.25
15230 PRINT @32,20:93.5,83-M,97.5-M,81,97.5-M,79,93,74.25+M
15240 PRINT @32,20:85.5+M,78,85.5+M,81.5-M
15250 NEXT M
15270 PRINT @32,21:97.5,81
15275 FOR M=0 TO 6 STEP 0.25
15280 PRINT @32,20:101.5,83-M,109.5-M,81.5,109.5-M,78
15300 PRINT @32,20:102,74.25+M,97.5+M,79,97.5+M,81
15310 NEXT M
15320 RETURN
```

Graphics to fill in; Neck

```
15330 PRINT @32,21:93.5,83
15335 FOR M=0 TO 5 STEP 0.25
15340 PRINT @32,20:93.5,90-M/5,95.5,87.5-M,99.5,87.5-M,101.5,90-M/5
15350 PRINT @32,20:101.5-M,83+M/7,97.5,81+M,93.5+M,83
15360 NEXT M
15370 RETURN
```

Jaw

```
15375 PRINT @32,21:93.5,90
15377 FOR M=0 TO 2.25 STEP 0.25
15380 PRINT @32,20:101.5-M,90,99.5-M,87.5+M,95.5+M,87.5+M,93.5+M,90
15382 NEXT M
15390 RETURN
```

Draws arrows to the back

```
15400 PRINT @32,21:88.5,63
15405 FOR M=0 TO 2.5 STEP 0.1
15410 PRINT @32,20:88.5-M,63+M
15420 NEXT M
15430 FOR M=0 TO 1.5 STEP 0.1
15440 PRINT @32,20:85.9+M,65.6+M
15445 NEXT M
15450 PRINT @32,20:86,67.5,87.5,67.2,87.5,65.7
15460 PRINT @32,21:106.5,63
15470 FOR M=0 TO 2.5 STEP 0.1
15480 PRINT @32,20:106.5+M,63+M
15490 NEXT M
15500 FOR M=0 TO 1.5 STEP 0.1
15510 PRINT @32,20:109.1-M,65.6+M
15520 NEXT M
15530 PRINT @32,20:109,67.5,107.5,67.2,107.5,65.7
15540 RETURN
```

Underlines major headings on datasheet pages

```
16000 GO TO I9 OF 16010,16017,16017,16020,16030,16040,16070
16010 MOVE 0,84
16015 DRAW 6,84
16017 RETURN
16020 MOVE 0,92.2
16025 DRAW 24,92.2
16027 RETURN
16030 MOVE 0,98
16035 DRAW 20,98
16037 MOVE 0,55.5
16038 DRAW 19,55.5
16039 RETURN
16040 MOVE 0,69.5
16050 DRAW 34,69.5
16060 RETURN
16070 MOVE 0,89.5
16080 DRAW 46,89.5
16090 RETURN
```

PROGRAM 11 - DATA ENTRY REMINDERS
SUMMARY PAGE
DATASHEET ITEM NAMES AND DATABASE

Program 11 contains three BINARY DATA strings. The first two data strings are the displays for the 'data entry reminders' and the 'summary page', both of which are displayed at the beginning of the diagnostic program. Initial construction of these data strings required input of test 'operators.' String construction was performed by utility programs and entered onto the file as data. They cannot be read out literally since the text operators perform their designated functions when printed. The following two displays are the individual strings as they appear when printed.

DATA ENTRY REMINDER STRING -

REMEMBER...
1. Use DATASHEETS when entering data.
2. Enter information by CODE NUMBER.
3. Follow each code number with RETURN.
4. RE-ENTER codes to erase.
5. INPUT CHANGES can be made at the END.
6. Press RETURN to go on to next page.

Press RETURN to continue.

SUMMARY PAGE STRING

The computer-assisted diagnosis program can aid the Corpsman in differentiating illnesses which represent both the most common and most serious causes of acute chest pain.

The five illnesses which are considered by the computer are MYOCARDIAL INFARCTION, ANGINA, NON-SPECIFIC CHEST PAIN, PNEUMONIA, and PNEUMOTHORAX. Non-specific chest pain is intended to include those cases which are non-surgical, not life-threatening, and, therefore, not reasons for evacuation.

In addition to diagnosis, the chest pain computer program provides probabilities for the occurrence of 3 classes of post M.I. complications. These are: NO PROBLEMS, ARRYTHMIA, and PUMP FAILURE. It also predicts the likelihood of LIFE/DEATH post M.I.

IMPORTANT: Supplemental programs for the prediction of complications and the prediction of life/death are used only with cases of M.I.

THE CORPSMAN'S JUDGMENT MUST TAKE PRECEDENCE when any doubt exists. The computer does not have the capability to think or make the subjective evaluations which are so important in medical diagnosis.

The last character string is the diagnostic database (B$). The diagnostic database has three components; the first (SEG 1 to 3390) containes the datasheet item names and is used to construct the Case Summary Page, the second (SEG 3391 to 4520) contains the conditional probabilities used to compute the diagnostic probabilities as each datasheet item is entered, and the third section contains the datasheet item number display coordinates in ASCII format.

The datasheet item names are contained in 30 character segments. Access to a particular item name merely requires multiplying the item number by 30 and accessing the preceding 30 characters (see lines 5140 & 5200 of the diagnostic program).

The conditional probabilities are in segments of 10 characters; two characters for each diagnostic category. Access to one group of conditional probabilities requires multiplying the item number by 10, adding 3390 (length of datasheet names), and accessing the preceding 10 characters. NOTE: The conditional probabilities cannot be released at this time.

The datasheet item number display coordinates are appended to the end of the conditional probabilities and are in ASCII format and, therefore, not amenable to literal display. Each coordinate is composed of two characters which, when converted to 'real' numbers, are separated by a decimal point to yield the exact location of each datasheet item number on the display screen.

DIAGNOSTIC DATABASE (B$) (First segment only)

```
AGE <30                    AGE 30-39                  AGE 40-49
                AGE 49+                    DURATION <1HR
     DURATION 1-2HR             DURATION 2-4HR                DURATI
ON 4-12HR               DURATION >12HR              ONSET SUDDEN
          ONSET GRADUAL                CONTINUOUS PAIN
INTERMITTENT PAIN             RADIATION YES               RADIATION NO
                SITE CENTRAL                SITE ACROSS
     SITE LT. SIDE              SITE RT. SIDE                 SITE E
PIGASTRIC               SITE OTHER                  RADIATION TO LEFT
ARM         RADIATION TO RIGHT ARM       RADIATION TO BOTH ARMS
RADIATION TO BACK          RADIATION TO SHOULDER       RADIATION TO
 NECK              RADIATION TO JAW            RADIATION TO OTHER
     NUMBNESS PRESENT           NO NUMBNESS                 PAIN M
ODERATE                 PAIN SEVERE                 PROGRESS NOW BETTE
R           PROGRESS NOW WORSE          MOVEMENT AGGRAVATES
COUGH AGGRAVATES           BREATHING AGGRAVATES        SITTING AGGR
AVATES              AGGRAVATED BY OTHER         NOTHING AGGRAVATES
     NITRO RELIEVES             REST RELIEVES               WALKIN
G RELIEVES              RELIEVED BY OTHER           NOTHING RELIEVES
          NO DYSPNEA                  DYSPNEA THIS ILLNESS
HABITUAL DYSPNEA           NO COUGH                    COUGH THIS I
LLNESS              HABITUAL COUGH              NAUSEA PRESENT
     NO NAUSEA                  VOMITING PRESENT            NO VOM
ITING                   APPETITE NORMAL             APPETITE DECREASED
          BOWELS NORMAL               CONSTIPATION PRESENT
DIARRHEA PRESENT           PREVIOUS CHEST PAIN         NO PREVIOUS
CHEST PAIN         PREVIOUS ILLNESS            NO PREVIOUS ILLNESS
     PREVIOUS SURGERY           NO PREVIOUS SURGERY         TEMP <
98.6                    TEMP 98.6-100.2             TEMP 100.3-102
          TEMP >102                   PULSE <60
PULSE 60-80                PULSE 81-100                PULSE >100
                SYSTOLIC BP <100            SYSTOLIC BP 100-120
     SYSTOLIC BP 121-140        SYSTOLIC BP 141-160         SYSTOL
IC BP >160              DIASTOLIC BP <70             DIASTOLIC BP 71-80

          DIASTOLIC BP 81-90          DIASTOLIC BP 91-100
DIASTOLIC BP >100               MOOD NORMAL                 MOOD ANXIOUS
                MOOD DISTRESSED             COLOR NORMAL
     COLOR PALE                 COLOR FLUSHED               COLOR
CYANOTIC                SWEATING PRESENT            NO SWEATING
          SHIVERING PRESENT           NO SHIVERING
JVP NORMAL                 JVP ELEVATED                RESP. MOV. N
ORMAL               RESP. MOV. ABNORMAL         HEART SOUNDS NORMAL
     HEART SOUNDS ABNORMAL      PERCUSSION NORMAL           PERCUS
SION DULL               PERCUSSION HYPER-RESONANT   CHEST SOUNDS NORMA
L           CHEST SOUNDS RHONCHI        CHEST SOUNDS RALES
CHEST SOUNDS DECREASED     SGOT <50                    SGOT 51-100
                SGOT 101-200                SGOT >200
```

PROGRAM 12 - DATASHEET DISPLAY PAGES STRINGS

Program 12 contains the seven datasheet display pages which are presented during data input. These pages are contained in file 12 as BINARY DATA and are read and displayed by the diagnostic program. The following displays are the individual character strings as they appear when printed.

DISPLAY PAGE STRING #1

PAIN

DURATION OF PAIN:

<1 HR------(5) 2-4 HR-----(7)

1-2 HR-----(6) 4-12 HR----(8)

>12 HR-----(9)

ONSET OF PAIN:

SUDDEN----(10) GRADUAL--(11)

TIME COURSE OF PAIN:

CONTINUOUS-----(12)

INTERMITTENT---(13)

RADIATION:

YES-------(14) NO-------(15)

DISPLAY PAGE STRING #2

SITE OF PAIN:

CENTRAL----(16) RT. SIDE---(19)

ACROSS-----(17) EPIGASTRIC-(20)

LT. SIDE---(18) OTHER------(21)

RADIATES TO:

LT. ARM---(22) SHOULDER---(26)

RT. ARM---(23) NECK-------(27)

BOTH ARMS-(24) JAW--------(28)

BACK------(25) OTHER------(29)

DISPLAY PAGE STRING #3

NUMBNESS:

YES----------(30) NO----------(31)

SEVERITY OF PAIN:

MODERATE-----(32) SEVERE------(33)

PROGRESS:

BETTER-------(34) WORSE-------(35)

AGGRAVATING FACTORS:

MOVEMENT-----(36) COUGH-------(37) BREATHING-----(38)

SITTING------(39) OTHER-------(40) NONE----------(41)

RELIEVING FACTORS:

NITRO--------(42) REST--------(43) WALKING-------(44)

OTHER--------(45) NONE--------(46)

DISPLAY PAGE STRING #4

DYSPNEA:

NO-----------(47) THIS ILLNESS-(48) HABITUAL------(49)

COUGH:

NO-----------(50) THIS ILLNESS-(51) HABITUAL------(52)

NAUSEA:

YES----------(53) NO-----------(54)

VOMITING:

YES----------(55) NO-----------(56)

APPETITE:

NORMAL-------(57) DECREASED----(58)

BOWELS:

NORMAL-------(59) CONSTIPATED--(60) DIARRHEA-------(61)

DISPLAY PAGE STRING #5

MOOD:

NORMAL----(86) ANXIOUS-----(87) DISTRESSED-(88)

COLOR:

NORMAL----(89) PALE--------(90) FLUSHED----(91) CYANOTIC--(92)

GENERAL EXAMINATION

SWEATING:

YES-------(93) NO----------(94)

SHIVERING:

YES-------(95) NO----------(96)

JUGULAR VENOUS PULSE:

NORMAL----(97) RAISED------(98)

RESPIRATORY MOVEMENT:

NORMAL----(99) ABNORMAL---(100)

DISPLAY PAGE STRING #6

PAST HISTORY

PREVIOUS CHEST PAIN:

YES-------(62) NO----------(63)

PREVIOUS CARDIO-RESPIRATORY ILLNESS:

YES-------(64) NO----------(65)

PREVIOUS MAJOR SURGERY:

YES-------(66) NO----------(67)

VITAL SIGNS

TEMPERATURE	PULSE	BLOOD PRESSURE systolic	BLOOD PRESSURE diastolic
<98.6-(68)	<60-(72)	<100-(76)	<70-(81)
98.6-100.2-(69)	60-80-(73)	100-120-(77)	71-80-(82)
100.3-102---(70)	81-100-(74)	121-140-(78)	81-90-(83)
>102---(71)	>100-(75)	141-160-(79)	91-100-(84)
		>160-(80)	>100-(85)

DISPLAY PAGE STRING #7

GENERAL EXAMINATION (cont'd)

HEART SOUNDS:

NORMAL--(101) ABNORMAL--(102)

PERCUSSION:

NORMAL--(103) DULL------(104) HYPER-RESONANT--(105)

CHEST SOUNDS:

NORMAL--(106) RHONCHI---(107) RALES-----(108) DECREASED--(109)

SGOT:

<50-----(110) 51-100----(111) 101-200---(112) >200-------(113)

PROGRAM 13 - NAME, CASE COUNTER, LAST CASE MEMORY

PROGRAM 13 allows space for the name of the boat to which the tape belongs (N$; at the present time, the name has been set to NAVSUBMEDRSCHLAB), the case counter (Q), and the 'last case' stored as J$. The name is a string 50 characters long and is accessed by 'READ@33:N$'. The case counter is an 8 column array where Q(1) through Q(5) represent the number of cases of each category which have been placed into memory as either simulated or real cases. Q(7) and Q(8) represent the number of real and simulated cases, respectively. The Q array must be dimensioned to 8 before reading. The last case is stored after Q as a 147 character string (refer to lines 6050 - 6189 for segmental listing), J$.

PROGRAMS 14 THROUGH 27 - DATAFILES

PROGRAMS 14 through 27 allow space for all cases which are placed into memory. Each datafile is 'primed' with the name of the research laboratory (NAVSUBMEDRSCHLAB) as a 50 character string and each case run on the diagnostic program is sequentially added to each file to a maximum of 40 cases in each file. After the 40th case, the next case is entered onto the next datafile. If all datafiles become full (containing 560 cases), data will no longer be entered onto datafiles but will still be entered into file 13 as the 'last case'.

3.2 THE PROGNOSTIC PROGRAM (PROGRAM 7)

The prognostic program calculates probabilities that a patient suspected of MYOCARDIAL INFARCTION will develop one of three kinds of problems (No problems, Arrythmia, and Pump failure) and the likelihood that the same patient will live or die even if placed in a hospital.

The user accesses the prognostic program by way of the chest pain diagnostic program (Program 10). The chest pain diagnostic probability must be highest for MYOCARDIAL INFARCTION before the user is given the option to obtain prognostic probabilities.

On the following pages the program is reproduced with some notes to aid in understanding the flow of the program. The line demarcations below serve to provide additional information regarding program organization.

LINES	FUNCTION
100 - 410	Sets variables and calculates probabilities for problems using symptom profile from diagnostic program
420 - 910	Case summary page construction
912 - 1040	Resets variables, display additonal symptom page
1045 - 1250	Additional data input subroutine
1265 - 1790	Calculates probabilities for live/die prognosis, goes to case summary page and draws bar graph
1792 - 1910	Augments case memory string with additional symptoms, saves it in data file and then offers choices for next interaction
5000 - 5050	Calculates running probabilities
8000 - 9020	Draws circle or 'X' for input page

Dimension variables and set initial values

Access data file and read data strings

Calculates conditional probabilities for problems

Calculates final probabilities for problems

Displays headings for display

Graphics for display page

Display history and physical exam symptoms

Prints "simulated case" when required

Prints out % probabilities for problems

Graphics for bargraph

```
100 REM
110 DIM P7(3),P5(3),C$(700),P$(300),P6(30),L$(760),D(2)
120 J1=0
130 P6=1
140 P7=1
145 B1=0
270 FIND 8
280 READ @33:C$,P$,L$
290 FOR I=1 TO 113
300 IF P(I)=0 THEN 380
310 FOR J=1 TO 3
320 Z$=SEG(C$,(I-1)*6+(2*J-1),2)
330 B(J)=VAL(Z$)
340 NEXT J
350 FOR J=1 TO 3
360 P7(J)=P7(J)*B(J)
370 NEXT J
380 NEXT I
390 FOR I=1 TO 3
400 P5(I)=P7(I)/SUM(P7)*100
410 NEXT I
420 IF B1=1 THEN 435
430 PRINT "L",K$,"IIHHHHHHPATIENT SSN: ";S$;"IIII  AGE: ";A;
432 GO TO 440
435 PRINT "L",K$,"IIHHHHHHPATIENT SSN: ";S$;"IIII *AGE: ";A;
437 PRINT "^JLIFE/DEATH PROBABILITIES (MI only)"
438 GO TO 450
440 PRINT "^JPROGNOSIS PROBABILITIES-COMPLICATIONS (MI only)"
450 PRINT @32,21:0,95
460 PRINT @32,20:130,95,103,94.75,0,94.75,0,94.5,130,94.5
470 PRINT @32,21:0,8
480 PRINT @32,20:0,93,90,93,90,92.8,0,92.8,0,92.6,45,92.6,45,20,45,92.6
485 IF B1=0 THEN 490
486 PRINT @32,20:90,92.6,90,7,0,7,0,15,45,15,45,7,45,15,90,15,90,7
487 PRINT @32,20:90,15,90,7.2
488 GO TO 510
490 PRINT @32,20:90,92.6,90,7,0,7,0,15,30,15,30,7,30,15,60,15
500 PRINT @32,20:60,7,60,15,90,15,90,7,90,15,75,15,90,15,90,7.2
510 PRINT @32,20:0,7.2,0,7.4,90,7.4
520 PRINT @32,21:0,89
530 PRINT "  HISTORY:I          PHYSICAL EXAM:J"
532 IF B1=1 THEN 1410
540 FOR I=1 TO 67
550 IF P(I)=0 THEN 580
560 Z$=SEG(B$,30*(I-1)+1,30)
570 PRINT "  ";Z$
580 NEXT I
585 PRINT @32,21:0,83
590 FOR I=68 TO 113
600 IF P(I)=0 THEN 630
610 Z$=SEG(B$,30*(I-1)+1,30)
620 PRINT USING "28T,FA":Z$
630 NEXT I
640 IF O$="N" OR O$="n" THEN 670
650 PRINT @32,21:32.8,15.7
660 PRINT "SIMULATED CASE"
670 PRINT @32,21:2.4,11.5
680 IMAGE 6D.1D,"%",15D.1D,"%",12D.1D,"%"
690 PRINT USING 680:P5(1),P5(2),P5(3)
710 PRINT "   NO PROBLEMS        ARRYTHMIA       PUMP FAILURE"
720 PRINT @32,21:93,37.2
730 PRINT @32,20:130,37.2
740 PRINT @32,21:94,92
750 PRINT @32,20:94,52,130,52,130,52.3,94.2,52.2,94.2,92
760 PRINT @32,20:94,72,130,72
770 PRINT @32,21:97.5,49
```

C$= *probabilities for calculating prognostic problems*

P$= *display for additional symptom input*

L$= *probabilities for live/die calculations, and names and co-ordinates of additional symptoms*

Prints out bargraph and footnote for problems

Resets variables for live/die calculations

Display page for additional symptom input

Additional symptom # input and validity check

Extracts live/die probabilities from L$

Flow directors

Calculates final probabilities for live/die

```
775 IF B1=1 THEN 1710
780 PRINT "   NP AR PF"
790 FOR I=1 TO 3
800 IF P5(I)<1 THEN 860
810 PRINT @32,21:97.4+I*5.4,52
820 FOR K=0 TO 2.64 STEP 0.33
830 PRINT @32,20:97.4+I*5.4+K,52+P5(I)*0.4
840 PRINT @32,20:97.6+I*5.4+K,52+P5(I)*0.4,97.6+I*5.4+K,52
850 NEXT K
860 NEXT I
870 PRINT "IJJJJIIIHHCODES (NP/AR/PF)"
880 PRINT "_JIIIHHNP = No Problems_IIIHHAR = Arrythmia_IIIHH";
890 PRINT "PF = Pump Failure"
900 PRINT "JJJJJJPress Return for LIFE/DEATH Probabilities ";
910 INPUT Z$
912 D=1
913 B1=1
915 P6=0
917 A6=1
918 R=1
920 PRINT P$
930 PRINT @32,21:0,18
940 PRINT @32,20:130,18,130,0,0,0,0,18
950 PRINT "J INPUT DATA CODES:I              (re-enter to delete)";
960 E=0
970 F=9.5
980 C=0
990 C=C+1
1000 MOVE E,F
1010 IF C<>9 AND C<>17 THEN 1030
1020 PRINT
1030 PRINT "        GG";
1040 GIN E,F
1045 INPUT Z$
1050 GO TO LEN(Z$)+1 OF 1262,1120
1060 FOR K=1 TO 5
1070 PRINT @32,21:3,1
1080 PRI "GERROR: THE DATA CODE ENTERED IS NOT ON THIS PAGE; PLEASE RE";
1090 PRINT "-ENTER!K"
1100 NEXT K
1110 GO TO 990
1120 Y$=SEG(Z$,1,1)
1130 IF ASC(Y$)<48 OR ASC(Y$)>56 THEN 1060
1140 Z=VAL(Z$)
1190 V$=SEG(L$,(Z+112)*4+1,2)
1200 W$=SEG(L$,(Z+112)*4+3,2)
1210 V1=VAL(V$)
1220 W1=VAL(W$)
1230 GOSUB 8000
1240 GOSUB 5000
1250 GO TO 990
1262 FOR I=1 TO 113
1270 IF P(I)=0 THEN 1360
1310 E$=SEG(L$,(I-1)*4+1,2)
1313 IF E$="00" THEN 1360
1320 F$=SEG(L$,(I-1)*4+3,2)
1330 E=VAL(E$)
1340 F=VAL(F$)
1350 A6=A6*(E/F)
1360 NEXT I
1370 A7=A6/(A6+1)
1380 D(1)=100-100*A7
1390 D(2)=100*A7
1400 GO TO 420
```

Prints history symptoms for live/die display

```
1410 FOR I=1 TO 67
1420 IF P(I)=0 THEN 1510
1430 Z$=SEG(B$,30*(I-1)+1,30)
1450 Q$=SEG(L$,(I-1)*4+1,2)
1470 IF Q$="00" THEN 1490
1480 PRINT " *";Z$
1484 GO TO 1510
1490 PRINT "  ";Z$
1510 NEXT I
1511 FOR I=1 TO 8
1512 IF P6(I)=0 THEN 1515
1513 Z$=SEG(L$,(I-1)*30+517,30)
1514 PRINT " *";Z$
1515 NEXT I
```

Prints physical symptoms for live/die display

```
1519 PRINT @32,21:0,83
1520 FOR I=68 TO 113
1530 IF P(I)=0 THEN 1620
1540 Z$=SEG(B$,(I-1)*30+1,30)
1560 Q$=SEG(L$,(I-1)*4+1,2)
1580 IF Q$="00" THEN 1600
1590 PRINT USING "27T,FA,FA":"*";Z$
1595 GO TO 1620
1600 PRINT USING "28T,FA":Z$
1620 NEXT I
```

Prints "simulated case" when appropriate

```
1623 PRINT
1630 IF O$="N" OR O$="n" THEN 1660
1640 PRINT @32,21:32.8,15.7
1650 PRINT "SIMULATED CASE"
```

Prints live/die probabilities

```
1660 PRINT @32,21:2.4,11.5
1670 IMAGE 10D.1D,"%",21D.1D,"%"
1680 PRINT USING 1670:D(1),D(2)
1690 PRINT "   DIE EVEN IN HOSPITAL      LIVE IN HOSPITAL"
```

(Graphics for bargraph)

```
1700 GO TO 720
1710 PRINT "   DIE  LIVE"
1715 J1=0.75
1720 FOR I=1 TO 2
1730 IF D(I)<1 THEN 1785
1740 PRINT @32,21:97.4+J1*8,52
1750 FOR K=0 TO 2.64 STEP 0.33
1760 PRINT @32,20:97.4+J1*8+K,52+D(I)*0.4
1770 PRINT @32,20:97.6+J1*8+K,52+D(I)*0.4,97.6+J1*8+K,52
1780 NEXT K
1785 J1=J1+1.25
1790 NEXT I
```

Draws bargraph

Adds additional symptom input to case memory string

```
1792 FOR I=1 TO 8
1794 T$=CHR(P6(I))
1796 J$=J$&T$
1798 NEXT I
```

Display next interaction choices

```
1800 PRI " JJJJIIIHHNEXT INTERACTION  JIIIHH1. Obtain definition IIIHH";
1810 PRINT "2. Display treatment IIIHH3. Another diagnosis";
1820 PRINT " IIIHH4. End interaction"
```

Saves updated case counter and updated case memory string

```
1821 FIND 13
1822 WRITE N$,Q,J$,P4
1823 CLOSE
1824 IF Q(7)+Q(8)>560 THEN 1835
1825 FIND 14+INT((Q(7)+Q(8))/40)
1826 ON EOF (0) THEN 1829
1827 READ @33:Z$
1828 GO TO 1827
1829 WRITE J$
1830 CLOSE
```

Interaction choice input and validation check	1835 PRINT " IIIHHCHOICE: G"; 1840 INPUT Y$ 1850 IF LEN(Y$)<>1 THEN 1830 1860 IF ASC(Y$)<49 OR ASC(Y$)>52 THEN 1830
Flow directors	1870 IF Y$="4" THEN 1900 1880 IF Y$="1" OR Y$="2" THEN 9000 1881 Y$="4" 1882 GO TO 9000 1900 PAGE 1910 END
Calculates running propabilities for live/die	5000 IF P6(Z)=1 THEN 5040 5010 P6(Z)=1 5020 A6=A6*(V1/W1) 5030 RETURN 5040 A6=A6/(V1/W1) 5045 P6(Z)=0 5050 RETURN
Finds coordinates for drawing hexagrams	8000 Z$=SEG(L$,(Z-1)*4+485,1) 8010 V=ASC(Z$) 8020 Z$=SEG(L$,(Z-1)*4+486,1) 8030 V=V+ASC(Z$)/100 8040 Z$=SEG(L$,(Z-1)*4+487,1) 8050 W=ASC(Z$) 8060 Z$=SEG(L$,(Z-1)*4+488,1) 8070 W=W+ASC(Z$)/100
Draws hexagram around symptom numbers	8080 IF P6(Z)=1 THEN 8170 8100 FOR K=1 TO 3 8110 W=W+0.25 8120 PRINT @32,21:V-3.4,W-0.65 8130 PRINT @32,20:V-3.4,W+1.85,V-0.9,W+3.35,V+2.1,W+3.35,V+4.6,W+1.85 8140 PRINT @32,20:V+4.6,W-0.65,V+2.1,W-2.15,V-0.9,W-2.15,V-3.4,W-0.65 8150 NEXT K 8160 RETURN
Draws "X" through symptom numbers	8170 PRINT @32,21:V+0.4,W+1 8180 PRI @32,20:V+4.4,W+5,V+4.6,W+4.8,V-3.2,W-3.1,V-3.4,W-2.9,V+0.4,W+1 8190 PRI @32,20:V-3.4,W+4.8,V-3.2,W+5,V+4.6,W-2.9,V+4.4,W-3.1,V+0.4,W+1 8200 RETURN
Clears memory and returns to diagnostic program	9000 DELETE 100,8999 9005 DELETE C$,P$,L$,P7,P5,P6,D2 9010 FIND 10 9020 CALL "LINK",240

PROGRAM 8 - PROGNOSTIC PROBABILITIES AND DISPLAY PAGE

Program 8 contains three binary data strings (C$, P$, L$). The first string contains probabilities for the calculation of prognostic problems (No problems, Arrythmia, and Pump failure). The probabilities are stored in segments of 6 characters; two characters for each problem category. The conditional probabilities cannot be released at this time.

The second string (P$) contains one display page string. This page requests data from the user for three additional symptom categories. The user's responses are employed in the calculation of probabilities that the patient will live or die even if placed in a hospital.

DISPLAY PAGE STRING

LIFE/DEATH Probabilities:

BODY BUILD:
NORMAL----(1) OBESE-----(2)

CORPSMAN OPINION OF PATIENT'S CONDITION:
GOOD------(3) DUBIOUS---(4) POOR------(5)

DURATION OF PAIN (refined):

<6 HR-----(6) 6-24 HR---(7) >24 HR----(8)

The third string (L$) contains conditional probabilities for the calculation of live/die probabilities (conditional probabilities cannot be released at this time), symptom names used by the program, and coordinates that identify the location of item numbers on the display page. Each coordinate is composed of two characters which, when converted to 'real' numbers are separated by a decimal point to yield the exact location of each datasheet item number on the display screen.

SECTION 4 - REFERENCES

1. Arthur, D. C., Computer-assisted diagnosis program for acute abdominal pain program elements, NAVSUBMEDRSCHLAB Report #974, January 1982.

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Diagnosis (medicine); biomedicine; computer applications; chest pain; myocardial infarction; pneumonia; pneumothorax; angina; non-specific chest pain

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Chest pain is the presenting symptom for several very serious illnesses, some having potentially fatal outcomes. In addition, chest pain has been reported to be one of the most frequent causes of medical evacuation from submarines. The Naval Submarine Medical Research Laboratory is developing programs, in the style of the computer-assisted diagnosis program for acute abdominal pain, to assist the submarine corpsman in the diagnosis, triage, and management of chest pain illness. The purpose of the present report is to summarize and document the progress to date on the computer-based (cont'd)

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diagnostic program for chest pain. The disorders considered are: myocardial infarction, angina, pneumonia, pneumothroax, and non-specific (non-life-threatening) chest pain. A very preliminary version of outcome of M.I. (myocardial infarction) is also presented.

As it stands, the chest pain diagnostic/prognostic program described here is not ready for clinical use. Revision of both parts of the program to incorporate ECG measures and recent findings regarding the indicant-disease relationships is in progress.